

THE SYSTEMATICS OF THE APETALOUS FUCHSIAS OF SOUTH AMERICA, *FUCHSIA* SECT. *HEMSLEYELLA* (ONAGRACEAE)¹

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ABSTRACT

A systematic revision of *Fuchsia* sect. *Hemsleyella*, a distinctive group of apetalous species restricted to the tropical Andes, is presented. Fourteen species are recognized, including three new species. Members of this group are protogynous and are hummingbird pollinated; they are generally rare and present little opportunity for sympatry or interspecific hybridization. The first reported chromosome counts for the section indicate that seven species are diploid and two are tetraploid; two possible hybrids were also tetraploid. Pollen grains in the section are large, with the longest axis usually over 100 μm long, and are basically 2-aperturate, although 3-aperturate grains are present in some species; there is no clear correlation between polyploidy and 3-aperturate pollen grains in this section. A series of specialization trends linked mostly to increasing seasonality is evident in the section: from species with leaves that are opposite-ternate, persistent and elliptic-ovate to ones with alternate, deciduous, cordate and long-petioled leaves; from terrestrial to epiphytic or rock-inhabiting shrubs; from non-tuberous to tuberous plants; and from short- or medium-length floral tubes to floral tubes over 10 cm long. In its assemblage of characters, sect. *Hemsleyella* is most similar to sect. *Ellobium*, from Mexico and Central America.

Within the highly distinctive Onagraceae, *Fuchsia* contains over 100 of the ca. 675 species in the family. It shows no obvious relationships to any of the other 16 genera and is unique in the family in its fleshy fruits and basically 2-aperturate pollen, being placed accordingly in its own tribe, Fuchsieae. The last generic monograph of the group was published by Munz in 1943. In recent years, an effort has been made towards a systematic reassessment of the entire genus, under the direction of Peter H. Raven; this has resulted so far in the revision of all the Mexican and Central American species of *Fuchsia* (Breedlove, 1969; Breedlove et al., 1982), as well as the large South American sect. *Fuchsia* (Berry, 1982).

Over three-quarters of the species of *Fuchsia* occur in South America. Among them, Hemsley (1876) first recognized the existence of a particular group of species characterized by the absence of petals, generally alternate leaves, and a mostly deciduous, epiphytic or saxicolous habit.

This group was not formally designated, however, until Munz (1943) conferred upon it a sectional status, under the name *Hemsleyella*. Munz included 12 species and 13 different taxa in this section; one of these, *F. decidua*, is now placed in the recently described sect. *Ellobium* (Breedlove et al., 1982).

Members of sect. *Hemsleyella* are a difficult group to study because the plants are generally scarce, strongly seasonal, and occupy relatively inaccessible habitats. This section occurs sympatrically with sect. *Fuchsia* over most of its range in the tropical Andes. While conducting field studies on the latter group in 1978–1980, the author was able to observe most members of sect. *Hemsleyella* in the field and to collect series of herbarium specimens and cytological samples. In addition, loans of sect. *Hemsleyella* from numerous institutions were examined. As a result, it was possible to make a substantial revision of Munz's (1943) treatment, including new ecological, cytological, palynological, and taxonomic

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information. The following revision now recognizes 14 species in sect. *Hemsleyella*, the second largest in the genus; only six of these species are the same as ones recognized by Munz (1943), and three new species are described.

GEOGRAPHICAL DISTRIBUTION AND ECOLOGY

Distribution. *Fuchsia* sect. *Hemsleyella* is restricted to the moist slopes of the tropical Andes, from ca. 10°N to 17°S latitude. Its range coincides very closely with that of the larger sect. *Fuchsia* (see Berry, 1982, fig. 1), and therefore it is useful to discuss the distribution of the different species in light of the major structural units of the tropical Andes recognized by Berry (1982, fig. 12). Only four species of sect. *Hemsleyella* occur in the northern Andes, which includes Venezuela, Colombia, and Ecuador; two of these occupy the northern extreme of the Cordillera Oriental in Venezuela, whereas the other two occur in Ecuador. Curiously, there is no sure record of sect. *Hemsleyella* from Colombia. In the Central Andes, which include Peru and Bolivia, ten different species occur. As in sect. *Fuchsia*, a single species is found along the relatively dry Pacific slopes of the Cordillera Occidental in northern Peru; one species is restricted to the Cordillera Central in Peru, two occur in both the Cordillera Central and Cordillera Oriental, while six different species are restricted to the Cordillera Oriental in southern Peru and Bolivia.

The greatest local concentrations of species in sect. *Hemsleyella* occur in the moist valleys of Dept. Cuzco, Peru, and in the yungas of Dept. Cochabamba, Bolivia, with five species present in each area.

The most specialized species in the section occur in the Central Andes, where the most prominent tuber development, longest floral tubes, and highly seasonal species occur; unspecialized species are found in both the Northern and Central Andes.

Habitat and phenology. *Fuchsia cestroides* inhabits montane scrub vegetation in northwestern Peru and occupies the lowest altitudinal range in the section (1,100–1,700 m). All other species in the section occur in Andean cloud forest above 1,600 m, and some extend into the lower reaches of the open puna or subpáramo. *Fuchsia apetala* is most common at the upper cloud forest-puna limit and is known to reach 4,200 m in Peru, where it is subject to frequent frosts. In Venezuela, *F. membranacea* extends

from 2,600 to 3,400 m at the upper limit of cloud forest and the lower reaches of open páramo.

Broad altitudinal ranges of more than 1,000 m are common in species of sect. *Hemsleyella*, by virtue of their versatile habit; plants are generally terrestrial towards their upper altitudinal limit and are often epiphytic towards the lower limit of their range.

The species of sect. *Hemsleyella* are among the most strongly seasonal in the genus. All species flower primarily in the dry season, when many are totally deciduous. This results in a limited flowering season, unlike the members of sect. *Fuchsia*, which are far less seasonal and flower over a more extended period, even though they inhabit the same areas as species of sect. *Hemsleyella*. Strong vegetative growth occurs during the rainy season, and the presence of tubers or thickened stems in species of sect. *Hemsleyella* enables food and water to be stored for the dry season flowering.

Due in part to the infrequent occurrence of plants belonging to sect. *Hemsleyella* in their native habitat, their often epiphytic or scandent habit, and their adaptation to a short dry season and extended moist season, members of this group are particularly intolerant of habitat disturbance, and the survival of many species with limited geographical ranges is being endangered by the rapid advance of forest clearing along the steep Andean slopes.

FLORAL BIOLOGY AND POLLINATION

In details of floral biology, sect. *Hemsleyella* is similar to the situation described by Berry (1982) for sect. *Fuchsia*: the flowers are strongly protogynous (Fig. 1), yet they last several days, and self-pollination can occur before stigma receptivity ends. The stigmas are generally exerted beyond the anthers, but since the flowers are pendant and the pollen contains viscin threads, pollen grains can in some cases reach the stigma of the same flower by wind or gravity. The species of sect. *Hemsleyella* are hermaphroditic, and self-incompatibility is not known for any of the species.

All species of sect. *Hemsleyella* are characterized by the presence of reddish (pink, violet, or orange), odorless, hanging flowers, all with floral tubes from 18 to 160 mm long and copious nectar production from a large nectary situated at the base of the floral tube and followed by a constriction just beyond it. With clusters of flowers

flowering simultaneously on different branches, those species offer a striking floral display, and all species are visited by hummingbirds. On legitimate visits, the hummingbirds approach the flower from below, hover while extracting the nectar from the base of the tube, and then rapidly continue on to the next flower. Few identifications of pollinators were possible, but an emerald hummingbird (*Amazilia* sp.) was seen pollinating a population of *F. tillettiana* (including *Berry* 4289) sporadically from daybreak to dusk, at 1,600 m in Edo. Mérida, Venezuela, in April 1984.

Three species of sect. *Hemsleyella*, *F. apetala*, *F. garleppiana*, and *F. inflata*, often have floral tubes over 10 cm long. The only hummingbird with a bill long enough to reach the nectar reservoir without piercing the tube is the swordbill, *Ensifera ensifera*. This remarkable hummingbird has a bill almost as long as its body, often surpassing 10 cm in length. In August 1979, swordbills were observed visiting long-tubed plants of *F. inflata*, on the outskirts of the town of Marcapata, ca. 3,000 m, Dept. Cuzco, Peru; since the flowers of this species hang down off leafless and erect or divergent shoots and often from rock overhangs, it is easy for a swordbill to approach from below and insert its bill in the tube. Because of the correspondence in bill and tube length, the bird makes contact first with its head to the stigma, then with the anthers. Individuals of *Ensifera* were also seen visiting shorter-tubed flowers of *F. chloroloba*, but their bodies did not contact the anthers.

In populations of long-tubed plants of *F. inflata* examined in August 1979, on the road from the Abra de Málaga towards Quillabamba (Prov. La Convención, Dept. Cuzco, Peru), the majority of the flowers had been pierced at the base of the floral tube by nectar robbers, as evidenced in specimens such as *Berry & Aronson* 2567 and 2570.

CYTOLOGY

Fuchsia has retained the original basic chromosome number of the family Onagraceae, $n = 11$ (Raven, 1975). Unlike the situation in some of the other tribes in the family, aneuploidy and translocation systems are unknown in the Fuchsiaeae. Kurabayashi et al. (1962) considered the chromosomes of *Fuchsia* to be large and unspecialized for the family, with poor differentiation into heterochromatic and euchromatic portions.



FIGURE 1. Portion of a flower of *Fuchsia inflata* (*Berry & Aronson* 3013) during the first day of anthesis, showing the sticky, receptive stigma and unopened anthers (protogyny).

Polyploidy does occur in *Fuchsia* and has proven to be somewhat useful in characterizing the different sections of the genus. All species of sects. *Ellobium*, *Schufia*, *Jimenezia*, *Skinnera*, and *Encliandra* have been counted and were found to be diploid, except for one individual of sect. *Encliandra* (Breedlove, 1969; Breedlove et al., 1982; Raven, unpubl. data). *Berry* (1982) found that sect. *Fuchsia* is predominantly diploid; 37 species examined were diploid, five were tetraploid, and one species had both diploid and tetraploid populations. The monotypic sect. *Kierschlegeria* is tetraploid, and sect. *Quelusius* is entirely polyploid, with three known tetraploid and one octoploid species (*Berry & Ramamoorthy*, unpubl. data).

Prior to this study, no chromosome counts had been published for sect. *Hemsleyella*. Twenty-two new counts are reported here for the first time in the section, as listed in Table 1, including nine of the 14 species and two possible hybrids. The methods used were the same as those described in *Berry* (1982). Diploid chromosome

TABLE 1. Chromosome numbers in *Fuchsia* sect. *Hemsleyella*.

Taxon	<i>n</i>	<i>2n</i>	Collection Data
<i>F. apetala</i> Ruiz & Pavón		ca. 44	PERU. CUZCO: Tres Cruces, Prov. Paucartambo, <i>Berry et al.</i> 2593 (MO).
	22		PERU. CUZCO: below Abra de Málaga, Cuzco-Quillabamba Road, Prov. Convención, <i>Berry & Aronson</i> 3030 (MO).
		44	PERU. JUNÍN: 32 km E of Comas, on road to Satipo, <i>Berry & Aronson</i> 3069 (MO).
<i>F. aff. apetala</i> Ruiz & Pavón		22	PERU. CUZCO: 91 km from Ocongate, above Marcapata, <i>Berry & Aronson</i> 3014 (MO).
<i>F. cestroides</i> Schulze-Menz	11		PERU. CAJAMARCA: 6 km above San Benito towards Guzmango, <i>Berry et al.</i> 3600 (liquid specimen, author's collection).
<i>F. chloroloba</i> I. M. Johnston	11		PERU. CUZCO: above Buenos Aires, Acanaco to Pilcopata, Prov. Paucartambo, <i>Berry et al.</i> 2599 (MO).
	11		PERU. CUZCO: 92 km from Ocongate, above Marcapata, <i>Berry & Aronson</i> 3015 (MO).
		22 ^a	CULTIVATED: Berkeley, California, <i>Univ. California Botanical Garden</i> accession N° 49.817. Originally from Peru, no voucher.
<i>F. garleppiana</i> Kuntze & Wittmack		22 ^b	BOLIVIA. COCHABAMBA: 41 m from Cochabamba on road to Chapare, <i>Berry</i> 3640 (live tubers sent for cultivation to MO; same site where <i>Berry & Berry</i> 2582 was collected).
<i>F. inflata</i> Schulze-Menz	11		PERU. CUZCO: Km 145–146 from Cuzco to Quillabamba, <i>Berry & Aronson</i> 3036 (MO).
		22	PERU. CUZCO: Km 150 from Cuzco to Quillabamba, <i>Berry & Aronson</i> 3040 (MO).
<i>F. × inflata</i> (probable hybrid)	ca. 22 ^c		PERU. CUZCO: 88 km from Ocongate above Marcapata, <i>Berry & Aronson</i> 3010 (MO).
	ca. 22 ^c	44	PERU. CUZCO: 88 km from Ocongate, above Marcapata, <i>Berry & Aronson</i> 3011 (MO).
<i>F. juntasensis</i> O. Kuntze	ca. 22		BOLIVIA. COCHABAMBA: above ENDE pumping station at Corani, <i>Berry</i> 3638 (MO).
<i>F. membranacea</i> Hemsley	11		VENEZUELA. MÉRIDA: 13 km above Timotes, <i>Berry</i> 3278 (MO, VEN).
	11		VENEZUELA. MÉRIDA: 12.5 km below Apartaderos, <i>Berry</i> 3465 (MO, VEN).
<i>F. tillettiana</i> Munz	11		VENEZUELA. LARA: Laguna La Blanquita, Parque Nacional Yacambú, <i>Berry</i> 3259 (MO, VEN).
	11		VENEZUELA. LARA: Parque Nacional Yacambú, above Sanare, <i>Berry</i> 3469 (MO, VEN).
	11		VENEZUELA. MÉRIDA: 1 km above San José towards Mucutuy, <i>Berry</i> 3463 (MO, VEN).
	11		VENEZUELA. TACHIRA: between Zumbador and Queniquea, <i>Berry</i> 3033 (MO, VEN).
<i>F. tunariensis</i> O. Kuntze		22 ^b	PERU. AYACUCHO: 45 km E of Tambo, towards Calicanto, <i>Berry</i> 3051 (MO).

^a Counted by Peter H. Raven.
^b Counted by Peter Goldblatt.
^c With bridges and fragments present at Anaphase I.

numbers were obtained for seven species and tetraploid counts for two species and two putative hybrids. Thus, as in sect. *Fuchsia*, sect. *Hemsleyella* is predominantly diploid, though apparently with a somewhat higher proportion of tetraploid species. The two tetraploid species are not closely related to each other, but each is closely related to a different diploid species. In sect. *Fuchsia*, on the other hand, most of the tetraploid species were either geographically isolated or morphologically very distinct from the rest of the species in the section.

SYMPATRY AND HYBRIDIZATION

Because of the scarcity and relatively few collections of members of sect. *Hemsleyella*, little is known about the occurrence of interspecific hybridization in this group. For some species, such as *F. cestroides*, *F. insignis*, and *F. pilaloensis*, there is virtually no chance for sympatry, as they occur in areas well isolated from other species in the section. Other species, such as *F. tillettiana* and *F. membranacea*, or *F. garlepiana* and *F. juntasensis*, grow in the same areas, but in different altitudinal ranges. *Fuchsia nana* and *F. apetala* generally occur close to timberline, well above cloud forest occupied by other members of sect. *Hemsleyella*.

The greatest chance for sympatry and possible interspecific hybridization is found in two areas where many members of the section have been collected: several valleys of Dept. Cuzco, Peru, and the yungas of Dept. Cochabamba, Bolivia. Nonetheless, the only observed case of close sympatry in the section was the finding of *F. inflata* and *F. chloroloba* flowering side by side in Prov. Paucartambo, Peru. Collections from plants in this area showed a series of individuals with unusual morphological variability (Berry & Aronson 3010, 3011, 3012, 3013, and 3016), as well as tetraploid individuals with somewhat aberrant meiosis, providing some evidence that natural interspecific hybridization may be occurring between different members of the section there.

Members of sect. *Hemsleyella* commonly occur in the same locations as species belonging to sect. *Fuchsia*. With the marked morphological differences between those two sections, one would not expect to find intersectional hybrids. However, one possible case of intersectional hybridization has been detected in a series of Bolivian collections made by W. M. S. Brooke in August



FIGURE 2. Habit of *Fuchsia inflata* (Berry & Aronson 3036) growing from tubers out of rocks and flowering on leafless stems, Prov. La Convención, Dept. Cuzco, Peru (Aug. 1978).

1950, at Incachaca, Dept. Cochabamba. The sets of Brooke 6666, 6666a, and 6666c, at BM, F, NY, and U, all appear to belong unequivocally to *F. juntasensis*, having been collected in different conditions of sun or shade. Sheets of Brooke 6666b, however, at BM, F, and NY, show some very different features. The specimen of Brooke 6666b at F (Herb. N° 1548145) was found "growing in the open but in high grass," according to the label; it has well-developed, opposite to ternate leaves present, whereas plants of *F. juntasensis* found growing in the sun generally flower when leafless. The shape of the flowers on this sheet correspond roughly to that expected for *F. juntasensis*, but some flowers have petals present; some of the petals are deformed and others are more or less oblanceolate and up to 15 mm long. Other flowers from the same collection lack petals altogether, and all have malformed, non-functional anthers. A band type nectary and connate sepal bases attest to the *Hemsleyella* par-



FIGURE 3. Epiphytic habit of *Fuchsia inflata* (Berry & Aronson 3038), several km below Berry & Aronson 3036 (Fig. 2).

entage of this plant. The sheet of *Brooke 6666b* at NY is similar to that described above, only the locality is not the same: "under trees in a light forest, flowers, varying shades of mauve." The third sheet at BM bears the same label information as the NY sheet, but appears to be *F. denticulata*, which had been collected previously in the area. Most likely, *Brooke 6666b* is a series of naturally occurring hybrids between *F. juntasensis* and *F. denticulata* (sect. *Fuchsia*).

MORPHOLOGICAL CHARACTERS

Habit. All species of sect. *Hemsleyella* are perennial shrubs, lianas, or epiphytes. The presumably least advanced species in the section, such as *F. juntasensis*, *F. cestroides*, and *F. tillettiana*, usually occur as upright to scandent shrubs 1–3 m tall, but *F. tillettiana* has also been found as a liana with long, flexuous branches clambering through woody vegetation on steep slopes. The closely related *F. membranacea* is generally terrestrial, but requires the aid of neighboring shrubs and trees to support its branches; it is also occasionally found as an epiphyte. *Fuch-*

sia apetala, *F. inflata*, and *F. juntasensis* all occur terrestrially near their upper altitudinal limits and epiphytically at lower elevations (Figs. 2, 3). *Fuchsia pilaloensis* grows either terrestrially or epiphytically at the same elevation in western Ecuador.

The more specialized species in the section have developed adaptations to strong seasonality; they are deciduous in the dry season and possess well-developed tubers. Many of these species, such as *F. apetala*, *F. garleppiana*, *F. inflata*, and *F. chloroloba*, grow primarily among rocks and secondarily as epiphytes. *Fuchsia garleppiana* and *F. inflata* produce upright, slender stems when terrestrial and divergent to hanging branches when epiphytic (see Figs. 2, 3). *Fuchsia apetala*, on the other hand, is unique in having a prostrate, almost creeping habit, with highly congested, knotty stems when terrestrial; as an epiphyte at lower elevations, the stems are more elongate and produce slender stolons.

Leaves. Fundamental differences in leaf arrangement, shape, and persistence occur in different groups of species in sect. *Hemsleyella*. One



FIGURE 4. Extensive tuber development in *Fuchsia* aff. *inflata* (Berry & Aronson 3010), a shrub growing among rocks in Prov. Quispicanchis, Dept. Cuzco, Peru.

group, presumably the primitive condition in the genus and in this section, has leaves that are opposite to ternate, medium-sized (3–10 cm long by 2–5 cm wide), with short petioles (mostly 5–25 mm long), elliptic to elliptic-ovate in shape, and only slightly to moderately deciduous.

A second, more advanced group in sect. *Hemsleyella* is strongly seasonal, and the species tend to flower in the dry season when all the leaves have fallen. In some species, such as *F. insignis* and *F. nana*, the leaves are practically unknown. In cases where the leaves are known, however, such as *F. apetala*, *F. chloroloba*, and *F. garleppiana*, they are alternate, large (5–14 cm long by 2–7 cm wide), long-petioled (15–70 mm long) and narrowly to broadly ovate in shape, with cordate bases and typically acuminate tips. Remaining species, such as *F. pilaloensis*, *F. salicifolia*, and *F. tunariensis*, are intermediate between the two groups described.

Tuber development. Outside of sect. *Hemsleyella* in *Fuchsia*, the presence of tubers is known only in two species of sect. *Ellobium*, which are principally rock-inhabiting or epi-

phytic. Likewise in sect. *Hemsleyella*, strong tuber development occurs in the species that are most markedly epiphytic or growing among rocks. Such species as *F. apetala*, *F. garleppiana*, and *F. inflata* bear cylindrical tubers that often grow between rocks or even may be exposed above the soil (see Fig. 4). The tubers of *F. chloroloba* (Fig. 12) are smaller and more spherical than those of the above-mentioned species. In general, the most seasonal species of this section, with marked leaf drop during the dry season, exhibit the strongest tuber development. On the other hand, most species with opposite, basically elliptic leaves tend to grow terrestrially and preserve their leaves for most of the year. These species, such as *F. membranacea*, *F. tillettiana*, and *F. huanucoensis*, show very little evidence of tuber development; instead, swollen, flexuous stems sometimes occur (see Fig. 21), and appear to provide a moderate food and water storage capacity to the plant.

Floral characters. *Hemsleyella* is the only section of *Fuchsia* that is characterized by the absence of petals in all species. The only other

species in the genus lacking petals is *F. procumbens* (sect. *Skinnera*), although other species of sects. *Skinnera* and *Ellobium* show strong tendencies toward petal reduction.

The length and shape of floral tubes serve as reliable specific characters in sect. *Hemsleyella*. *Fuchsia cestroides* has tubes just 18–20 mm long, and *F. nana* has tubes 21–31 mm long, whereas tubes exceeding 140 mm are known in *F. apetala* and *F. garleppiana*. With the exception of *F. apetala*, relatively little variation in floral tube length occurs within species; in some of the long-tubed species, the lower range of tube lengths can be attributed to measurements of young flowers whose sepals open upon drying. In *F. apetala*, two distinct floral lengths have been found, those with tubes 10–16 cm long and those with tubes 4–8 cm long. Although only two collections with intermediate tube lengths were seen, the paucity of collections and the close similarity of stem, leaf, and pubescence characters in plants of different tube length preclude subdividing *F. apetala* into separate taxa at this time.

In sect. *Hemsleyella*, a smooth band-type nectary lines the lowermost portion of the floral tube (see Berry, 1982, fig. 48). The nectary is similar to those found in sects. *Skinnera* and *Ellobium*. It usually causes the tube to appear bulbous at the base, a condition that also results in part from the occurrence of a constriction of the floral tube just beyond the nectary. The size of the basal, bulbous part of the tube varies between species, but in all of them it serves as a kind of nectar reservoir. Hairs on the inside of the tube are generally absent in the basal part of the tube and usually appear at the constriction and further up the tube; these hairs serve to prevent the nectar from flowing down and out of the tube. Particularly large nectar reservoirs and strong floral tube constrictions are characteristic of *F. inflata* (Fig. 14) and *F. chloroloba* (Fig. 12).

The connation at the base of the sepals is characteristic of all species of sect. *Hemsleyella* and is found elsewhere in the genus only in sect. *Quehusia*. The degree of connation, as well as the shape of the sepals, largely determine how far the sepals spread or become reflexed at anthesis. Strongly reflexed sepals occur in *F. tillettiana*, *F. insignis*, *F. huanucoensis*, and *F. juntasensis* (see Fig. 21), where they are characteristically long and narrow. The sepals of most other species are moderately spreading at anthesis.

Floral color is an important character in the section, but it is usually lost upon drying. The

sepals of most species differ in color from the tube, generally becoming greenish towards the apex. In *F. chloroloba*, a particularly striking contrast occurs between the glaucous, orange floral tube and the parrot green sepals. *Fuchsia inflata* also has mostly green sepals; however, their color intergrades less abruptly with that of the floral tube. Pale pink floral tubes occur in both *F. garleppiana* and *F. pilaloensis*. Other characteristic colors of floral tubes are red-purple (*F. nana*), cerise (*F. tillettiana*), and mauve or lavender (*F. juntasensis* and *F. cestroides*).

Pubescence. Vestiture characteristics, especially on the floral tubes and young vegetative parts, can be useful in distinguishing certain species of sect. *Hemsleyella*. *Fuchsia chloroloba* is remarkably glabrous throughout and is the only species with glaucous floral tubes. *Fuchsia juntasensis* and *F. membranacea* are generally subglabrous on both leaves and flowers. The flowers of *F. tillettiana* have gland-tipped hairs when fresh, a characteristic that helps distinguish it from the closely related *F. membranacea*. Several species are characterized by dense pubescence on young growth and noticeably pubescent flowers. *Fuchsia garleppiana* and *F. pilaloensis* have densely pilose or pilulose branchlets and young leaves; their floral tubes are likewise densely pilose. *Fuchsia tunariensis* is characterized by a fine, velutinous pubescence throughout, whereas *F. apetala* has a very shaggy, hirsute vestiture on young growth, ovaries, and the basal part of floral tubes.

Pollen. Pollen grains of *Fuchsia* share the distinctive features of other onagraceous pollen, such as viscin threads, protruding apertures, paracrystalline-spongy ectexine, and solid endexine. The genus is unusual, however, in its basically 2-aperturate condition, with bilaterally symmetrical grains, although a number of species have grains that are 3-aperturate and radially symmetrical. During the past ten years, *Fuchsia* has been the subject of intensive palynological studies, using light, scanning electron, and transmission electron microscopy (Nowicke et al., 1984; Praglowski et al., 1983; Skvarla et al., 1976, 1978). As a result of these studies, the most useful taxonomic characters within the genus have proven to be aperture number, viscin thread morphology, and pollen grain size.

Pollen grains of sect. *Hemsleyella* are basically 2-aperturate, but 3-aperturate grains have been found in several collections. Pollen of Berry & Aronson 3010, 3011, and 3012 (*F. aff. inflata*,

see Nowicke et al., 1984, fig. 76) is almost entirely 3-aperturate; chromosome counts of the first two collections indicate that they are tetraploid, but with meiotic abnormalities (see Cytology). In addition, pollen stainability of these collections varies widely, for example, 47%, 61%, and 99% in counts of 200 grains from different flowers of 3010 and 37%, 77%, and 88% in different flowers of 3012. Collections of *F. inflata* from other localities have entirely 2-aperturate pollen, and two chromosome counts from these plants were both diploid, so it seems possible that the series of Berry & Aronson 3010, 3011, and 3012 are allotetraploid hybrids of *F. inflata* and some other member of sect. *Hemsleyella*.

In two collections of diploid species, *F. tillettiana* (Berry 3267-B) and *F. membranacea* (Berry 3278), 5–10% of the grains were 3-aperturate. A probable tetraploid collection of *F. juntasensis*, Berry 3638, has entirely 2-aperturate grains. On the other hand, grains of Berry & Aronson 3071, a long-tubed collection of *F. apetala*, are mostly 3-aperturate; *F. apetala* is presumably a tetraploid species. In this manner, the correlation noted by Nowicke et al. (1984) for 3-aperturate grains in *Fuchsia* to be associated with polyploidy is not clearly evident in sect. *Hemsleyella*.

The viscin threads of sect. *Hemsleyella* are all segmented-beaded, which is considered the primitive condition for the genus and is shared with sects. *Fuchsia*, *Quelus*, *Ellobium*, and *Skinnera* (Nowicke et al., 1984). Smooth or sparsely segmented threads characterize the remaining sections.

The unusually large size of the pollen grains in sect. *Hemsleyella* is useful in distinguishing its members from other species in the genus. In seven species of sect. *Hemsleyella* examined by Pragłowski et al. (1983), the longest axis measured is between 97 and 130 μm , far longer than all but two of the remaining 50 species examined.

THE EVOLUTION OF *FUCHSIA* SECT. *HEMSLEYELLA*

A number of unique characters or ones found only in one or two other sections of *Fuchsia* occur in sect. *Hemsleyella* and make it a very distinctive and specialized group within the genus. These specialized characters include the following, with other sections sharing them indicated in parentheses:

1) Loss of petals (one species of sect. *Skinnera*,

although strong petal reduction occurs in other species of sects. *Skinnera* and *Ellobium*).

2) Smooth band nectaries (sects. *Skinnera* and *Ellobium*).

3) Presence of tubers in most species (sect. *Ellobium*).

4) Alternate leaves in some species (sects. *Skinnera* and *Kierschlegeria*).

5) Sepal connation beyond the floral tube (sect. *Quelus*).

6) Floral tubes more than 10 cm long in some species.

7) Strong seasonality, epiphytism, and dry season flowering with accompanying leaf drop (one species in sect. *Ellobium*).

All species in sect. *Hemsleyella* lack petals, have band nectaries, and have partially connate sepals. However, not all the species possess the remaining specialized features; those species with all or most of the above traits can be assumed to be most advanced within the section, whereas the species with characters common to the majority of the other sections in the genus, such as opposite-whorled leaves, little or no tuber development, medium-length floral tubes, and little seasonality, are interpreted as indication of lower levels of specialization and the more ancestral condition of the section. Based upon these criteria, the ancestors of sect. *Hemsleyella* would have been diploid, terrestrial, non-tuberous, moderately seasonal shrubs, with opposite-ternate leaves, moderate-length floral tubes (30–50 mm long), band nectaries, and reduced petals. The present-day group corresponding most closely to this assemblage of characters is sect. *Ellobium*, which includes three species ranging from Costa Rica to Central Mexico. Although occupying a more northerly range than sect. *Hemsleyella*, sect. *Ellobium* shows specialization trends very similar to those found in sect. *Hemsleyella*, including increasing seasonality and epiphytism, reduction in petal size, and a more marked presence of tubers (Breedlove et al., 1982). On the other hand, these same trends in sect. *Ellobium* are accompanied by a progression to much more congested and defined inflorescences than those found in sect. *Hemsleyella*. Berry (1982) considers sect. *Ellobium* to be a relatively recent arrival to Central America, based on the similarities of its pollen, leaves, and flowers to the more widespread and more numerous species belonging to the South American sects. *Fuchsia* and *Hemsleyella*. Whether sect. *Ellob-*

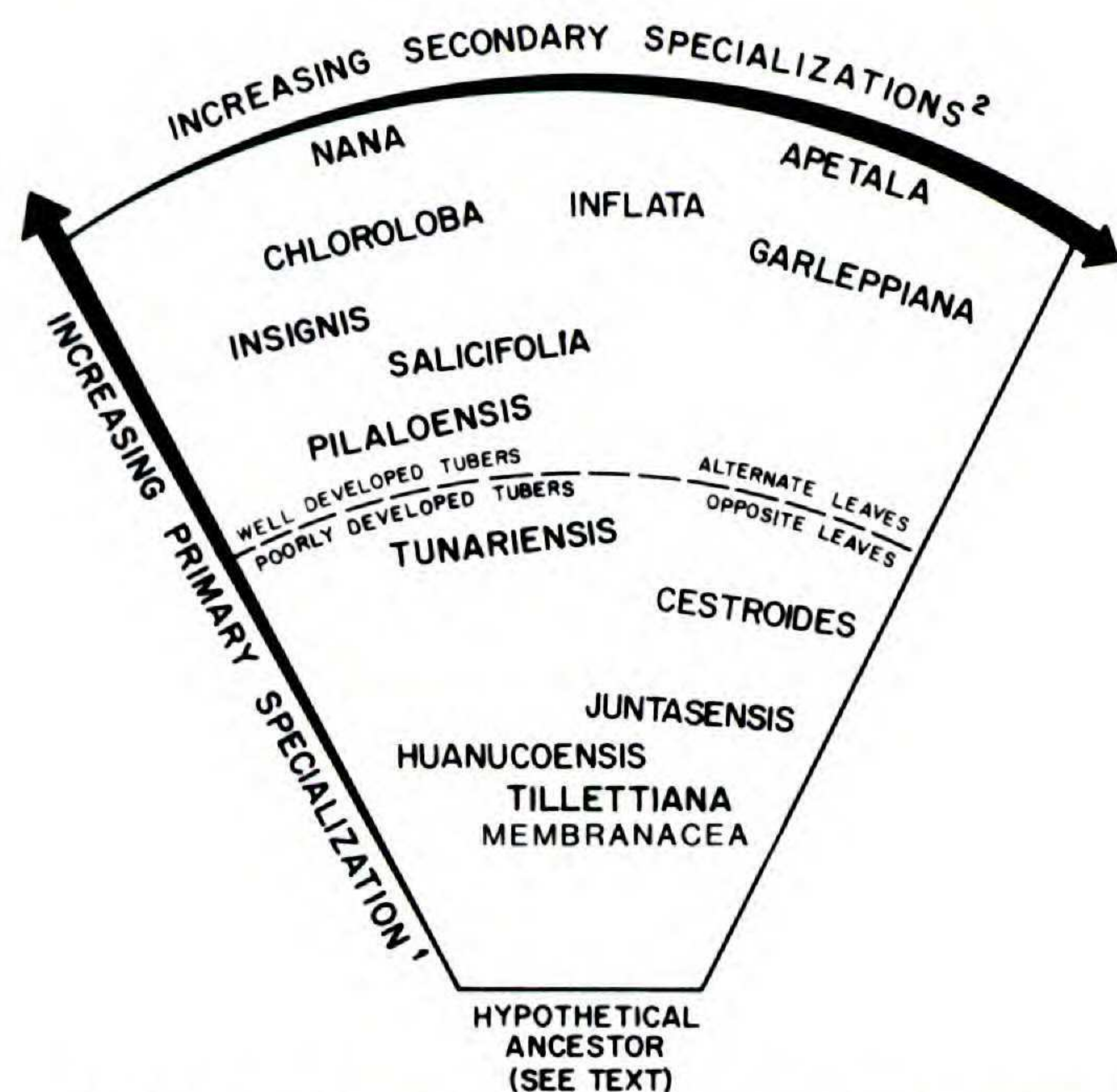


FIGURE 5. Specialization trends and interspecific relationships within *Fuchsia* sect. *Hemsleyella*.

ium is closely related to sect. *Hemsleyella* or whether their similarities are the result of convergent evolution is not presently clear. On the other hand, the altitudinal and geographical range of sect. *Hemsleyella* is very similar to that of sect. *Fuchsia*, a much larger and more generalized section of the genus; sect. *Hemsleyella* likely evolved from an early offshoot of sect. *Fuchsia* and then radiated in similar areas, occupying locally different habitats. Appropriate habitats for the epiphytic and saxicolous species of sect. *Hemsleyella* may have been more limited than the terrestrial forest edge habitat of most members of sect. *Fuchsia*, which may in part explain the greater success of the latter group, in terms of number of species and greater population sizes.

Within sect. *Hemsleyella*, individual species can be arranged schematically from least to most highly specialized, based on trends towards greater tuber development, increased epiphytism, longer floral tube length, higher altitudinal ranges, and stronger seasonality accompanied by a more deciduous habit, with large, alternate cordate leaves. A hypothetical scheme illustrating the above concepts of specialization trends and interspecific relationships within sect. *Hemsleyella* is shown in Figure 5.

HISTORY OF CULTIVATION

Because of their scarcity, non-shrubby habit, and adaptations to dry-season flowering, members of sect. *Hemsleyella* have rarely been cultivated. *Fuchsia apetala* (as *F. macrantha*) was

introduced into Great Britain in 1846 (Hooker, 1846); problems associated with its cultivation were treated by van Houtte (1848).

Within the past 50 years, three different apetalous species have been cultivated at the University of California Botanical Garden at Berkeley. *Fuchsia chloroloba* (U.C. Accession N° 36.1901) flowered and was collected there in 1939. Likewise, *F. inflata* (N° 38.1052) was collected in flower at Berkeley in 1940. Finally, *F. pilaloensis* (N° 58.782-1) was collected in flower from plants in cultivation in 1961 and 1965. None of these plants or their progeny have survived until the present, however.

In a popular article on Bolivian fuchsias, Brooke (1953) stated that two tuberous species of sect. *Hemsleyella* were in cultivation in Great Britain then, but she failed to mention where, or what species were involved.

Fuchsia garleppiana, *F. apetala*, and *F. tunariensis* were briefly in cultivation at the Missouri Botanical Garden during 1979–1980, but all subsequently died.

According to Wright (1979) and Ewart (1982), there are currently no species of sect. *Hemsleyella* known to be in cultivation.

SYSTEMATIC TREATMENT

Fuchsia* sect. *Hemsleyella Munz, Proc. Calif. Acad. Sci., Ser. 4, 25: 74. 1943. TYPE: *F. apetala* Ruiz & Pavón.

Erect to scandent shrubs, prostrate subshrubs, lianas, or epiphytes. Cylindrical to subspherical tubers or thickened stems often present. Leaves opposite, ternate or alternate, usually deciduous. Flowers hermaphroditic, brightly colored, pendant, usually axillary or clustered at the branch tips, or racemose in *F. cestroides*. Sepals shorter than the floral tube and connate at the base. Petals lacking. Stamens erect, in two whorls. Pollen 2-(3-)aperturate, bilaterally or radially symmetric, with segmented-beaded viscin threads. Berry with ca. 50–250 seeds, these compressed laterally and irregularly triangular-oblong in outline. Gametic chromosome number, $n = 11, 22$.

Distribution. Cloud forest or less commonly scrub forest, puna or subpáramo in the tropical Andes from Venezuela to Bolivia (10°N to 17°S), at altitudes of 1,100–4,200 m.

Measurements used in the key and species descriptions are based on dried herbarium specimens. Leaves are often lacking when flowering specimens are collected, but leaf position can be

determined by leaf scars on the stem. Terminology for leaf venation follows Hickey (1973). The use of the term “floral tube” refers to the position of the flower from the top of the ovary to the point of insertion of the filaments or the base of the sepals.

KEY TO THE SPECIES OF *FUCHSIA*
SECT. *HEMSLEYELLA*

- 1a. Leaves or leaf scars all or mostly opposite or ternate 2
- 1b. Leaves or leaf scars all or mostly alternate 7
 - 2a. Floral tubes 18–20 mm long; pedicels 3–4 mm long (2) *F. cestroides*
 - 2b. Floral tubes 25–56 mm long; pedicels 15–75 mm long 3
- 3a. Floral tubes and ovaries pubescent, with pilose, velutinous or gland-tipped hairs 4
- 3b. Floral tubes and ovaries glabrous or subglabrous 5
 - 4a. Floral tubes finely puberulent; sepals spreading; leaves velutinous on underside. Southern Peru and Bolivia (14) *F. tunariensis*
 - 4b. Floral tubes usually with gland-tipped hairs; sepals strongly reflexed at anthesis; leaves subglabrous. Venezuela (13) *F. tillettiana*
- 5a. Floral tubes narrowly funnelform, ca. 7 mm wide at the mouth, 31–34 mm long; sepals narrowly lanceolate, 4–5 mm wide. Central Peru (5) *F. huanucoensis*
- 5b. Floral tubes funnelform, 7–12 mm wide at the mouth, 25–51 mm long; sepals lanceovate, 4–11 mm wide. Venezuela, Bolivia 6
 - 6a. Petioles 4–10 mm long; sepals divergent to recurved at anthesis, lavender-violet, same color as floral tube. Bolivia (8) *F. juntasensis*
 - 6b. Petioles 10–35 mm long; sepals spreading at anthesis, greenish; floral tube pink. Venezuela (9) *F. membranacea*
- 7a. Floral tubes 21–31 mm long (10) *F. nana*
- 7b. Floral tubes 32–160 mm long 8
 - 8a. Floral tubes 70–160 mm long 9
 - 8b. Floral tubes 32–70 mm long 11
- 9a. Ovary and base of floral tube glabrous or densely canescent, the tube conspicuously bulbous at the base and strongly constricted in the lower 1/3, then abruptly widened to 8–14 mm in the middle (6) *F. inflata*
- 9b. Ovary and base of floral tube pilose to hirsute, the tube generally subcylindric, slightly bulbous at the base and 3–7 mm wide at broadest point 10
 - 10a. Floral tubes hirsute in lower 1/2, rose to dull orange, usually borne on short, knotty-tortuous stems (1) *F. apetala*
 - 10b. Floral tubes pilose to subglabrous, light pink, borne on smooth or more or less elongate stems (4) *F. garleppiana*
- 11a. Floral tubes and ovaries completely glabrous; sepals bright green throughout (3) *F. chloroloba*

- 11b. Floral tubes and ovaries lightly pubescent to densely hirsute; sepals not entirely bright green 12
 - 12a. Sepals 25–37 mm long 13
 - 12b. Sepals 10–25 mm long 14
- 13a. The longer stamens 30–40 mm long; sepals strongly recurved at anthesis (7) *F. insignis*
- 13b. The longer stamens 15–22 mm long; sepals spreading to divergent at anthesis (12) *F. salicifolia*
- 14a. Floral tubes and ovaries densely pilose or hirsute 15
- 14b. Floral tubes and ovaries puberulent or subglabrous 16
- 15a. Flowers generally borne on short, knotty stems with densely packed leaf scars; floral tubes rose to orange-red. Peru and Bolivia (1) *F. apetala*
- 15b. Flowers borne on loose shoots, not on short, knotty stems; floral tubes light pink. Western Ecuador (11) *F. pilaloensis*
- 16a. Floral tubes and undersides of leaves densely puberulent or velutinous; leaves ovate or elliptic-ovate with subacuminate tips (14) *F. tunariensis*
- 16b. Floral tubes and leaves subglabrous to sparsely pubescent; leaves narrowly lanceolate, with long acuminate tips (12) *F. salicifolia*

1. *Fuchsia apetala* Ruiz & Pavón, Fl. Peruv. 3: 89, pl. 322, fig. b. 1802. Macbride, Field Mus. Nat. Hist., Bot. Ser. 13: 546. 1941. TYPE: Peru. Dept. Junín: Huasahuasi (75°31–37'W, 11°15'S), Apr. 1779, Ruiz & Pavón (lectotype, MA, here designated; photograph, MO). There are four Ruiz and Pavón collections at MA which are labelled as *Fuchsia apetala*; the lectotype is one of two with “N° 11/90” written on a separate label at the base of the sheet, which also contains a lengthy, handwritten description of the plant, presumably by the collectors (see Fig. 6). The label cites at the end, “Habitat Huasahuasi in elevatis humidis et frigidis. Floret abri.” Figures 6–9.

Fuchsia macrantha Hooker, Bot. Mag. 72: t. 4233. 1846. Munz, Proc. Calif. Acad. Sci., Ser. 4, 25: 83. 1943, pro parte. TYPE: Peru. Dept. Junín: on trees in high mountains of Andamarca, 1836–1837, Mathews 1197 (holotype, K-Hooker Herbarium; isotypes, K-Bentham Herbarium, OXF, P, TCD, W).

Fuchsia hirsuta Hemsley, J. Bot. 14: 69. 1876. Munz, Proc. Calif. Acad. Sci., Ser. 4, 25: 81, pl. 13, fig. 70. 1943. TYPE: Peru. Dept. unknown, June 1854, Lechler 1989 (holotype, K).

Fuchsia unduavensis Munz, Proc. Calif. Acad. Sci., Ser. 4, 25: 81, pl. 13, fig. 71. 1943. TYPE: Bolivia. Dept. La Paz, Nor Yungas, Unduavi, 3,600 m, 13 Feb. 1907, Buchtien 2925 (holotype, US-1177335, photographs, NY, UC; isotypes, NY, Z).

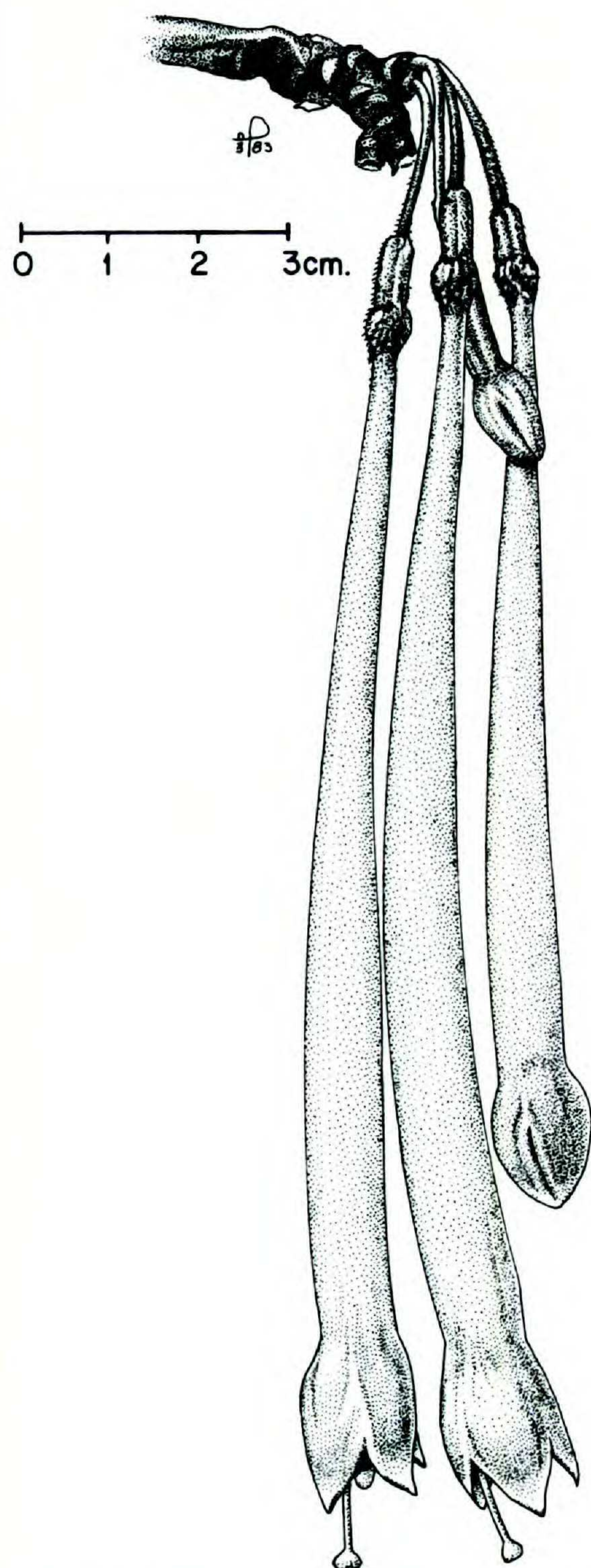


FIGURE 7. Flowering branch of *Fuchsia apetala*, long-tubed form, from Berry & Berry 3070, Dept. Junín, Peru.

Prostrate to hanging subshrubs in rock crevices or on the edge of banks rich in *Sphagnum* or humus, or vine-like epiphytes on moist tree trunks. Tubers ellipsoid to cylindrical, 2–8 cm long and 1–5 cm thick, covered by copper-tan, flaking bark, often interconnected by slender stems. Stoloniferous shoots 2–12 dm long when epiphytic (lacking when terrestrial), 2–4 mm thick with freely exfoliating red-copper bark; leaves

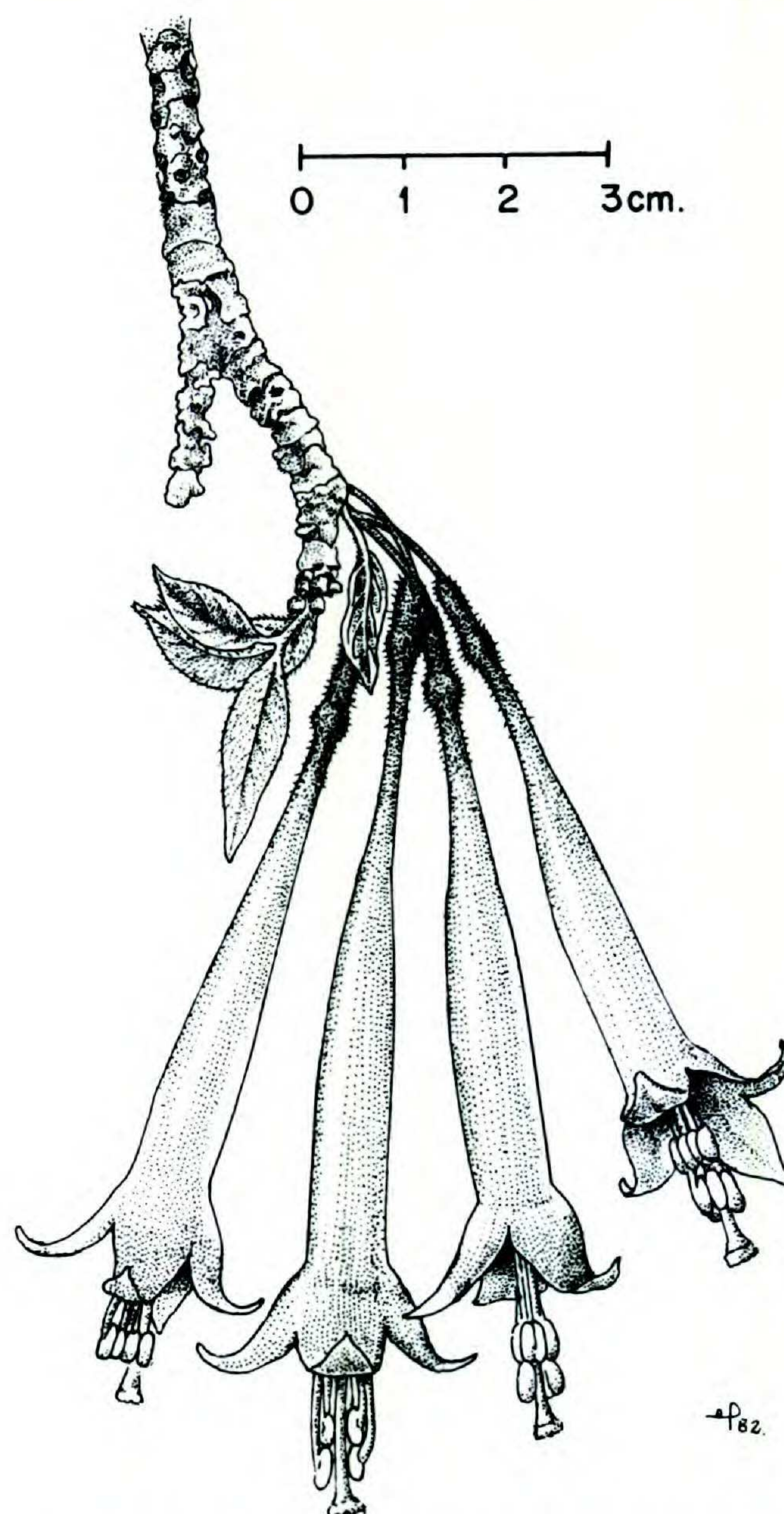


FIGURE 8. Flowering branch of short-tubed form of *Fuchsia apetala*, from Berry & Berry 2565, Prov. La Convención, Dept. Cuzco, Peru. Note the hirsute pubescence at the base of the floral tubes.

and flowers borne on short, lateral, knotty-tortuous stems with tightly packed leaf and pedicel scars, these stems rarely more than 4 cm long, 3–8 mm thick, dull gray, pilose to hirsute. Leaves alternate and usually tightly clustered at the branch tips, mostly deciduous at anthesis or present on plants flowering in shady habitats, soft membranous, subcordate to ovate-elliptic, 60–120(–150) mm long, 35–65 mm wide, apex acute to acuminate, base rounded to obtuse or subcordate, densely pilose-hirsute when young, green and subglabrous to strigose above at maturity, slightly paler and pilose below, with appressed, densely villous hairs along veins; margin sub-

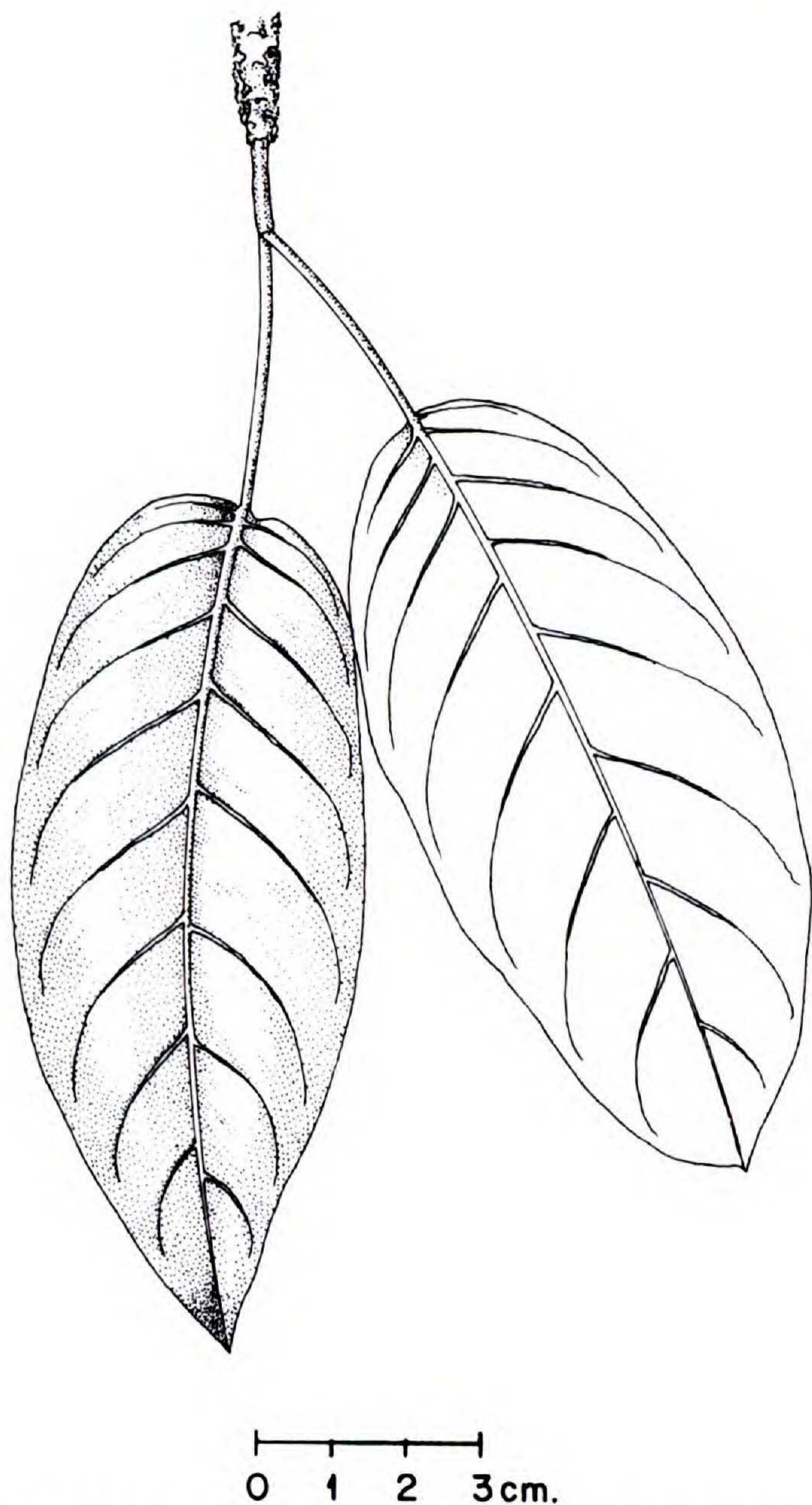


FIGURE 9. Leaves of *Fuchsia apetala*, from Berry & Berry 2564, Prov. La Convención, Dept. Cuzco, Peru.

entire to denticulate, secondary veins 6–8 on either side of the midvein. Petiole 25–50(–70) mm long, 2–3.5 mm thick, reddish, pilose; stipules filiform, 2–3 mm long, deciduous. Flowers crowded near the tip of lateral, knotty twigs, usually 3–12 per shoot; pedicels pilose to hirsute, (10–)18–35 mm long; ovary cylindrical, subtrigonous, 6–12 mm long, 2–4 mm thick, short pilose to densely hirsute, the hairs often shaggy and to 2 mm long. Floral tube subcylindrical, 4–16 cm long, 3–6 mm wide and somewhat nodose at the base around the nectary, then narrowed to 2–4 mm wide followed by a gradual widening until 7–10 mm wide at the rim, sometimes dilated to 8–13 mm wide just below rim, pilose to densely hirsute in the basal 1–2 cm, loosely pilose for the rest of length, inside subglabrous to vil-

lous 10–35 mm above the base. Sepals ovate, broadly acute, 16–25(–30) mm long, 7–12(–16) mm wide, usually broader than the tube, connate at the base for $\frac{1}{3}$ – $\frac{1}{2}$ the total length, free segments spreading to slightly recurved at anthesis. Tube rose to light orange-red, at times with a dark purple, nitid ring at the rim, sepals rose red and usually dull yellow-green distally. Nectary lustrous green-purple, lining the basal 5–6 mm of the tube. Filaments green to dull pink with age, the antesepalous ones 10–18 mm long, the antepetalous ones 8–15 mm long; anthers narrowly oblong, 3.5–4.5 mm long, 1.5–2 mm wide, yellow. Style pale green, subglabrous to densely (retorse) villous between 10–40 mm above the base, the basal 10–15 mm usually glabrous; stigma green, globose-capitate, slightly 4-cleft, 2–4 mm long, 1.5–2.5 mm wide, exserted 1–15 mm beyond the anthers. Berry oblong, red, subtrigonous, 17–25 mm long, 8–12 mm thick, subglabrous to densely hirsute, more or less verrucose, many-seeded. Gametic chromosome number, $n = 22$.

Distribution. Eastern slopes of the Peruvian Andes from Dept. San Martín south to Dept. Puno and in Bolivia, Depts. La Paz and Cochabamba; in upper cloud forest and the lower reaches of the puna, on rocks, tree trunks and *Sphagnum* banks, (2,800–)3,200–3,850(–4,200) m, but most common around 3,600 m. Flowering principally in the dry season, from June to September. Figure 10.

Specimens examined. PERU. SAN MARTÍN: valley of Rio Apisoncho, 30 km above Jucusbamba, 7°55'S, 77°10'W, Hamilton & Holligan 1003 (K), 1073 (K, UC). HUÁNUCO: Carpish summit, Ferreyra 2395 (USM), 10030 (USM); about Muña and Pillao, Lobb s.n. (W); Yanano, Macbride 3740 (F); Tambo de Vaca, Macbride 4970 (F, GH). PASCO: Pozuzo, Pearce 113 (K). JUNÍN: Prov. Concepción, 22 km E of Comas, Concepción-Satipo, Berry & Aronson 3068 (MO, USM); 32 km E of Comas, road to Satipo, Berry & Aronson 3069 (MO); 72 km E of Comas, Berry & Aronson 3070 (MO, USM); 82 km E of Comas, Berry & Aronson 3071 (MO); San José, road to Andamarca, Raimondi 45 (USM); Prov. Jauja, Hda. Runatullo, Weberbauer, 1920 (MO, USM). AYACUCHO: Prov. La Mar, E massif of Cordillera Central, between Tambo, San Miguel and Hda. Luisiana, ca. 75°33'W, 12°45'S, Dudley 11995A (NA), Dudley & Terborgh 12070H (NA); Prov. Huanata, entrance to mountains of Huantás, Raimondi 234 (USM); Prov. Cangallo, descent to Ocos, Vargas 15891 (CUZ); Punaccuanca Pass, West 3669 (GH, MO, UC). CUZCO: Prov. Convención, Km 140–144 from Cuzco to Quillabamba, below Abra de Málaga, Berry & Berry 2562 (MO), 2563 (MO), 2564 (MO), 2565 (MO), 2566 (MO), Berry & Aronson 3030 (MO, USM), 3033 (MO,

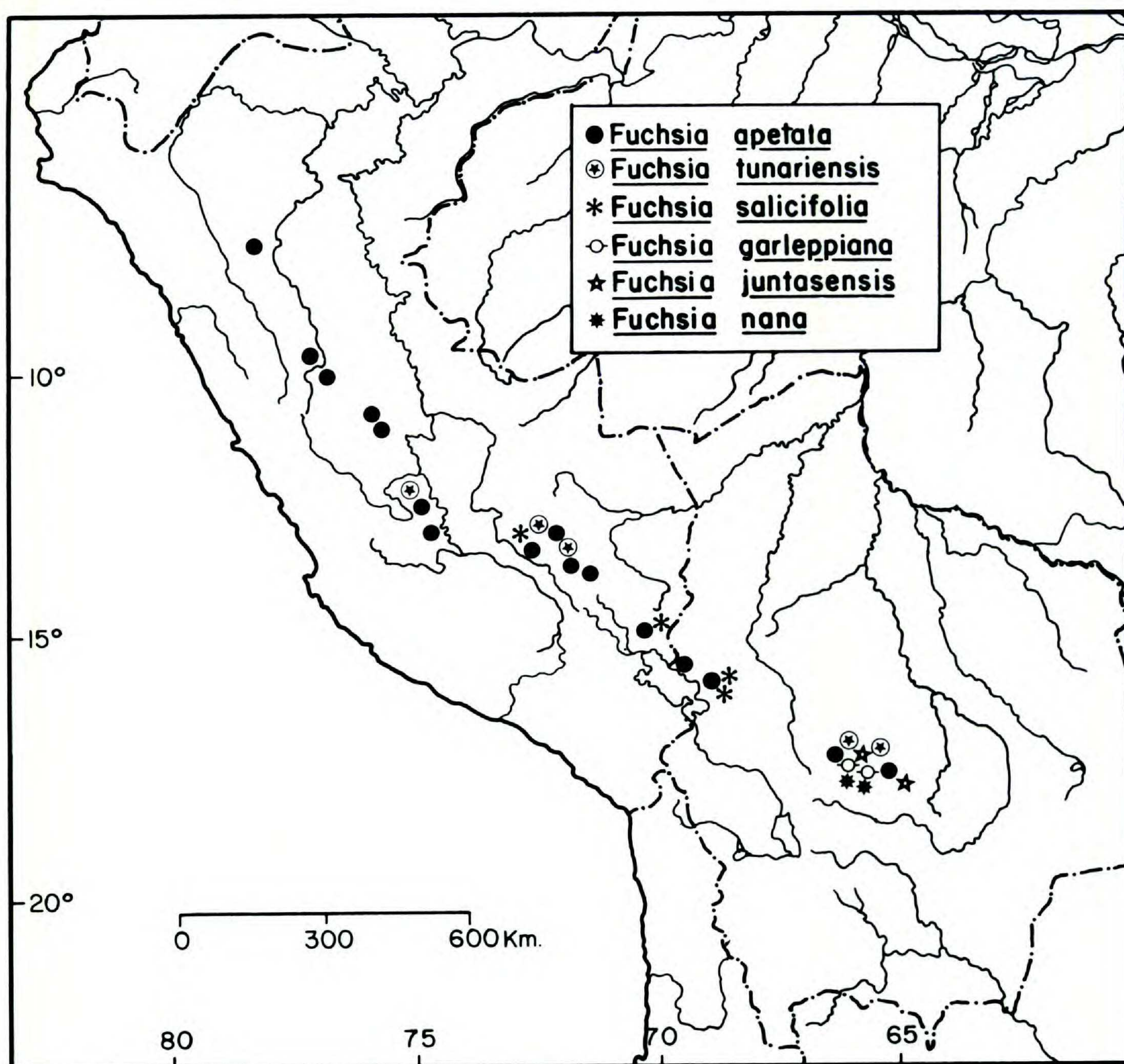


FIGURE 10. Distribution of the species of *Fuchsia* sect. *Hemsleyella* restricted to Bolivia or occurring in both Peru and Bolivia.

USM); Prov. Paucartambo, 1 km from Tres Cruces, road to Acanaco, *Berry et al.* 2593 (MO—2 sheets); Piñasniog, Panticalla Pass, *Cook & Gilbert* 1857 (US); Prov. La Convención, ca. 25 km NE of Hda. Luisiana and Rio Apurimac, *Dudley* 11215B (NA—2 sheets); Tres Cruces, *Gentry et al.* 23435 (MO), *Pennell* 13897a (PH), *Vargas* 12207 (CUZ), *Weberbauer* 6975 (F—2 sheets, GH); Salcantay, *Heim*, 1848 (Z), *Rauh* P1473 (RSA); Colinas de Sacsayhuamán, *Herrera* 2189 (BH, F), *Vargas* 1209 (CUZ); Yucay, *Soukup* 715 (BH, F, USM); Prov. Urubamba, Machu Picchu, 3 km from Inca Trail in Tres Piedras Blancas at Huayruro, *Peyton & Tilney-Peyton* 1056 (MO); Prov. Paucartambo, Pucara, Marcachea, *Vargas* 1599 (CUZ); Prov. Urubamba, Chincheros, *Vargas* 1641 (CAS, CUZ, UC), 9602 (BH, G-DEL, GH, K, MO, NA, UC); Combapata, Canchis, *Vargas* 1900 (CUZ, GH); Prov. Quispicanchis, Pucuta, Chutacuchu, Marcapata, *Vargas* 3750 (CUZ); Panticalla-Yanamanche, *Vargas* 4432 (CUZ); Prov.

Quispicanchis, Layampampa, *Vargas* 6649 (CUZ); Prov. Anta, Mollepata, toward Ramicruz, *Vargas* 8343 (CUZ); Prov. Calca, near Lares, *Vargas* 10962 (CUZ); Prov. Paucartambo, Dtto. Marcachea, forest of Pucara, *Vargas* 11170 (F, G-DEL, K, NA, UC); Prov. Urubamba, Peñas, *Vargas* 15730 (CUZ); without locality, *Weddell* 4771 (P); Prov. Paucartambo, between Acanacu Pass and Pillahuata, *West* 7074 (GH, UC). PUNO: Prov. Sandía, 7–15 km S of Limbani, *Metcalf* 30467 (A, G-DEL, MO, UC); region of Puno, *Soukup* 525 (F); Prov. Carabaya, between Ayapata and Kanelluyoc, *Vargas* 10789 (CUZ); Prov. Sandía, road to Oconeque, *Vargas* 14852 (CUZ); Agualani to Oconeque, *Vargas* 20654 (CUZ); Prov. Carabaya, *Weddell* 4682 (P). WITHOUT DEPARTMENT: Churupullana, *Dombey* s.n. (F, P), *Gay* s.n. (P), *Martinet* s.n. (P). BOLIVIA. LA PAZ: Prov. Murillo, valley of Zongo, 22 km beyond summit, *Beck* 2140 (LPB); Prov. Camacho, 2 km S of Ambana, *Beck* 4168 (MO); Nor Yungas, 2 km from Unduavi to

Coroico, *Berry & Berry* 2576 (MO); Yerbani, *Braun* 38 (US); Gran Poder, 40 km N of Sorata, below Tacacoma, *Brooke* 6434 (BM, F, G-DEL, NY, U); junction of road from La Paz to Coroico-Chulumani, *Brooke* 6904 (BM); Unduavi, *Buchtien*, 1910 (F); Ingenio, between Sorata and Mapiri, *Cárdenas* 1142 (NY), *Williams* 882 (BM, K, NY); above Pongo, *D'Arcy & Bejarano* 13940 (MO); Prov. Larecaja, near Sorata, *Mandon* 625 (BM, F, G, G-BOIS, GH, K, NY, P, S, W); Pelechuco, *Pearce*, 1864 (BM); Murillo, 22.5 km below Zongo dam, *Solomon* 8419 (MO); Sud Yungas, 16.2 km E of pass between Mururata and Illimani, *Solomon* 11377 (MO); Pongo, *Tate* 188 (NY—2 sheets); Cordillera Real, Rio Aceramarca, *Tate* 718 (NY); Prov. Larecaja, Valley of Tipuani, *Weddell*, 1851 (P). COCHABAMBA: Km 15 of Rodeo-Mizque road, *Badcock* 830 (K); Choro, Aparcita, *Brooke* 6098 (BM, F, G-DEL, NY, U); Choro, 100 mi. NW of Cochabamba, above Río Cocopata, *Brooke* 6134a (BM, F, NY, U), 6243 (BM); Incachaca, *Brooke* 6738 (NY), 6797 (BM); Incachaca Pass, *Brooke* 6920 (U); Luruni, hot springs above Quillacollo, trail to Cochabamba, *Brooke* 6786 (BM); Ayopaya, Sailapata, *Cárdenas* 3369 (US); Toralapa, way to Yungas da Vandiola, *Cárdenas* 3754 (POM); San Miguel, way to Morochata, Tunari, *Cárdenas* 4084 (RSA); Sehuenka-Carrasco, *Cárdenas* 6135 (US); Prov. Ayopaya, *Weddell* 4129 (P, US). WITHOUT DEPARTMENT: *Bang* 146 (BM), 2834 (F, GH, K, LE, MICH, MO, NY), *Bridges* s.n. (BM), *Pearce* 771 (K).

Fuchsia apetala was the first apetalous species described in the genus, but the notable differences between Ruiz and Pavón's type description and the accompanying illustration, as well as the apparent wide variation in floral tube lengths in the species, have led to differing interpretations as to what plants should be included under this name. It is clear from the original description and from most of Ruiz and Pavón's collections labelled by them as *F. apetala*, that they applied this name to plants with pilose floral tubes 10–14 cm long, with relatively small sepals and with flowers borne on short, knotty stems (see Figs. 6, 7). The plate that accompanies the type description, however, shows a plant with much shorter floral tubes, long-spreading sepals and smooth flowering and leaf-bearing stems; these discrepancies appear to be the result of a confusion of different apetalous specimens that they collected in central Peru, and not to different forms of the same species.

The herbarium at MA contains four different Ruiz and Pavón collections labelled as *F. apetala*. One of these bears a slip of paper with the name "Cavanilles" above the label and includes a plant with ampliate, short-tubed flowers 55–60 mm long and a single, large, ovate leaf 15 cm long by 9 cm wide, but with the typical knotty

stem of *F. apetala*. The remaining sheets all have long, narrow-tubed, subcylindrical flowers on verrucose stems, agreeing closely with the type description. The sheet chosen as the lectotype (Fig. 6) also contains a lengthy handwritten description very similar to the one used to describe the species and cites as the collecting locality one of the two sites mentioned in the type description, which states, "Habitat copiose in Huassahuassi et Muña nemoribus" (Ruiz & Pavón, 1802: 89). Unless there is a Huasahuasi in Dept. Huánuco, these localities correspond to two different areas, the first in Dept. Junín and the second on the Dept. Huánuco-Pasco border. Additional Ruiz and Pavón collections labelled as *F. apetala* are found at BM (three sheets, two with long floral tubes and one with a mixture of a long-tubed and a short-tubed plant), F (two fragments taken from MA, one from a long and narrow-tubed plant, the other from a short, broad-tubed individual), G (three sheets, all long-tubed, in G-DEL, G-BOIS, and G-"Pavón 213"), MO ("ex BM," long-tubed), and P ("Herb. Pavón 36," long-tubed). Subsequent authors treating the apetalous fuchsias based their concept of *F. apetala* either on the type description (Macbride, 1941) or else on the illustration (Hemsley, 1876; Munz, 1943, 1974).

As defined here, *F. apetala* is best characterized by the presence of short, knotty or verrucose stems on which the leaves or flowers are tightly grouped, as well as by a typically pilose to hirsute pubescence on the leaves and flowers. The leaves, although generally absent when the plant flowers, are larger and more ovate-cordate than any other apetalous species (except possibly *F. insignis*), and the tubers are particularly well developed. Populations of *F. apetala* may differ considerably in floral tube length, the only species in the section to do so; nonetheless, almost all of the plants share the aforementioned traits, as well as similarly short, ovate and dull-colored sepals with rose scarlet to dull orange floral tubes.

In general, the specimens of *F. apetala* can be divided into long-tubed (10–16 cm) or short-tubed (4–8 cm) groups. The long-tubed plants, including the type of *F. macrantha*, seem to grow mostly as epiphytes in cloud forest and are restricted to Depts. Huánuco, Pasco, and Junín, in Peru. Short-tubed plants, including the types of *F. hirsuta* and *F. unduavensis*, grow at higher elevations, either as epiphytes or more frequently terrestrially along banks or among rocks; these

plants occupy a wider range, from Dept. San Martín in Central Peru to Dept. Cochabamba in Bolivia. Very few specimens with intermediate tube lengths have been collected; *Macbride 4901*, with tubes 85 mm long, and *Macbride 4970*, with tubes 70–120 mm long, both from Dept. Huánuco in Peru, were the only such sheets seen. On the other hand, both short- and long-tubed plants have been found to occur in the same general area; in Dept. Junín, between Concepción and Satipo, individuals with floral tubes 6 cm long were found growing out of road banks at 3,600 m, 123–133 km west of Satipo (*Berry & Aronson 3068, 3069*). Further east along the same road, plants with floral tubes 12–13 cm long were found as epiphytes on *Blechnum* trunks, at 3,350–3,400 m, 72–73 km west of Satipo (*Berry & Aronson 3070, 3071*). Except for the difference in the tube length, the two populations are very similar in characters such as coloration, pubescence, tube shape, knotty stems, and leaf type; interestingly, the sepals are approximately the same size and shape in both populations, unlike the large, flaring sepals shown in the short-tubed plant in Ruiz and Pavón's illustration. Before deciding whether two distinct taxonomic entities should be recognized for the short-tubed and the long-tubed plants, it will be necessary to undertake more intensive collections in central Peru, where both forms and possibly some with intermediate tube lengths occur.

Three different short-tubed populations of *F. apetala* were examined cytologically, and all were tetraploid ($n = 22$). The only other tetraploids known in sect. *Hemsleyella* are the distantly related *F. juntasensis* and in a population of possible hybrids ($\times F. inflata$) in eastern Peru. Although no counts were obtained from long-tubed plants of *F. apetala*, *Berry & Aronson 3071* has a large percentage of triporate pollen grains, a character generally associated with polyploidy in the genus (Pragłowski et al., 1983; Nowicke et al., 1984).

A number of collections are doubtfully referred to *F. apetala* because they differ from the description and general characters of the species in one or more traits. Two of these are long-tubed plants from Ampay, Dept. Apurímac, Peru, that cannot be unequivocally placed either in *F. inflata* or *F. apetala*. *Vargas 1000* (BH, CUZ, GH, UC, 10 June 1938, 3,200–3,500 m) has floral tubes 11–12 cm long, which are pilose, yet ampliate as in *F. inflata* (10–16 mm diam. in the

middle of the tube); the leaves, however, are large and ovate-cordate, as in *F. apetala*. The second collection from Ampay, *Marín 2253* (F, July 1950, 3,600 m), has subcylindric, pilose floral tubes 90–105 mm long and ovate leaves, but lacks the knotty stems typical of *F. apetala*. *Dudley 11215B* (NA, 19 July 1968, Peru, Dept. Cuzco, Prov. La Convención, ca. 25 km NE of Hda. Luisiana and Río Apurímac) is a fairly typical short-tubed example of *F. apetala*, except for its very large and broad sepals 36 mm long by 17 mm wide. *Berry & Aronson 3014* (MO, 21 July 1978, Peru, Dept. Cuzco, Prov. Quispicanchis, 3,120 m, 91 km from Ocongate above Marcacata) has short, pilose floral tubes and knotty stems, but the tubes are more constricted than is usual in *F. apetala*, and the collection was diploid, $2n = 22$. *Chávez 3489* (MO, 12 Nov. 1976, Peru, Dept. Cuzco, Quebrada Las Peñas, 3,150 m, 10 dm tall in rock fissures) is a plant with somewhat knotty stems and moderately ampliate floral tubes, yet the flowers have fine, whitish pubescence and pink sepals, and it is seemingly intermediate between *F. apetala* and *F. tunariensis*.

Another group of old collections, presumably all from central Peru, recall the illustration that accompanies Ruiz and Pavón's type description of *F. apetala*. *Lobb s.n.* (K) has rather ampliate tubes 46–48 mm long, large and broad ovate sepals (18 mm long, 9 mm wide), smooth stems, and large leaves 13 cm long and 8 cm wide. *Lobb 112* (K, W, from Muña, Dept. Huánuco) has similar flowers, with tubes 58–60 mm long, sepals 21 mm long and 10 mm wide, and filaments 17–20 mm long. Similar collections are *Gay, 1839–1840* (P), but with very pilose leaves and knotty stems, and *Dombey s.n.* (F), from "Churupallana," with petioles to 6 cm long. It is possible that these collections correspond to Ruiz and Pavón's illustration accompanying the type description of *F. apetala* and that they represent a yet undescribed apetalous species from the Huánuco-Pasco region, most closely resembling *F. insignis* from Ecuador. Further field work will be necessary to determine if this is so.

2. *Fuchsia cestroides* Schulze-Menz, Notizbl. Bot. Gart. Berlin-Dahlem 15: 137. 1940. Macbride, Field Mus. Nat. Hist., Bot. Ser. 13: 550. 1941. Munz, Proc. Calif. Acad. Sci., Ser. 4, 25: 83, pl. 14, fig. 74. 1943. TYPE: Peru. Dept. Piura: Prov. Ayavaca, W slopes

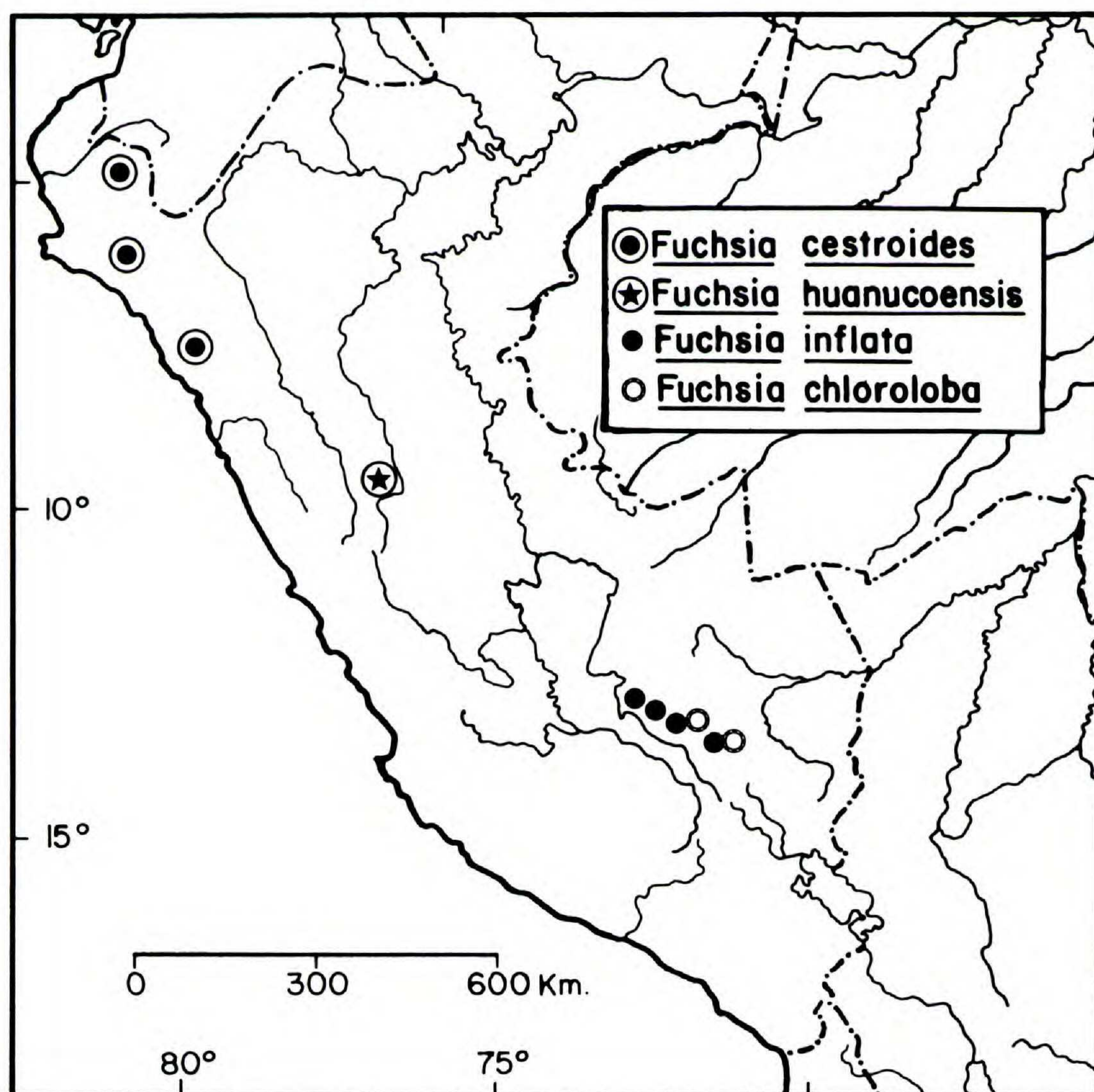


FIGURE 11. Distribution of the species of *Fuchsia* sect. *Hemsleyella* restricted to Peru.

of the Andes below Frias, 1,000–1,200 m, 21 May 1912, *Weberbauer* 6423 (holotype, B, destroyed in World War II; isotypes, F—2 sheets, GH, US; photographs of US isotype, BH, NY, UC).

Erect to scandent shrubs 0.5–3 m tall. Branchlets terete, 1.5–3 mm thick, puberulent to pilose; older stems 5–40 mm thick, with exfoliating bark. Leaves opposite or ternate, membranous, elliptic, 26–100 mm long, 14–15 mm wide, apex and base acute, subglabrous to puberulent above, puberulent below, especially on the veins; margin subentire to serrulate, secondary veins 6–14 on either side of the midvein. Petioles strigose, (2–)4–8 mm long. Stipules lanceolate, ca. 1 mm long, ca. 0.5 mm wide. Flowers generally numerous on terminal and axillary racemes with small, deciduous, lance-filiform bracts; rachis (15–)25–35 mm long. Pedicels puberulent, 3–4 mm long. Ovary cylindrical, 3–4 mm long, 1–1.5 mm wide, puberulent to pilose. Floral tube narrowly funnelform, 18–20 mm long, 2–3 mm wide at the

base, narrowed to ca. 1.5 mm wide in the lower $\frac{1}{3}$, then gradually widened to ca. 4 mm wide at the rim, lightly puberulent to pilose outside, retrorse villous inside in lower $\frac{1}{3}$. Sepals oblong-lanceolate, 5–7 mm long, 2.5–3 mm wide, obtuse to acute at the apex, connate for ca. 1.5 mm at the base, spreading at anthesis. Tube rose pink to lavender, sepals greenish (in bud) to dull purple. Nectary ca. 3 mm high. Filaments green, the antesealous ones 3.5–6(–7) mm long, the antepetalous ones 2–5 mm long; anthers broadly elliptic, yellow, ca. 1.5 mm long, ca. 1 mm wide. Style glabrous, exserted 5–8 mm beyond the anthers. Stigma clavate, 1.5–2 mm long, ca. 1 mm wide, slightly 4-cleft at the apex. Immature fruit oblong, 8 mm long, 5 mm wide, with ca. 50 seeds. Gametic chromosome number, $n = 11$.

Distribution. Northwestern Peru. Rare and endemic to scrub vegetation between 1,100 and 1,700 m on the Pacific-facing slopes of the Andes in Depts. Cajamarca, Lambayeque, and Piura. Figure 11.

Specimens examined. PERU. CAJAMARCA: Andaloy, between San Benito and Guzmango, 1,600–1,800 m, *Berry et al.* 3600 (liquid-preserved specimen, author's collection), *López & Sagástegui* 6251 (US). LAMBAYEQUE: Prov. Lambayeque, ca. Km 29 E of Olmos, between Olmos and Jaen on Mesones-Muro highway, 1,150 m, *Hutchison & Wright* 3408 (RSA, UC).

This is an extremely rare species that is somewhat unusual for the section. Indeed, Munz (1943) remarked that in its shrubby habit, opposite-ternate, elliptic leaves and dense inflorescences of small flowers, the type specimen of *F. cestroides* resembled fairly closely certain species in sect. *Fuchsia*, such as *F. lehmannii*. Nonetheless, the lack of petals and the band-type nectary clearly place it in sect. *Hemsleyella*. Geographically, *F. cestroides* is strongly isolated from other members of the section, by inhabiting the rather dry, open scrub vegetation of the Pacific slopes of the northern Andes of Peru.

The small number of specimens collected makes it difficult to assess the degree of variability in vegetative characters in *F. cestroides*. Both collections from Cajamarca were leafless when collected in flower, and the leaves present on *Hutchison & Wright* 3408, from Lambayeque, are quite distinct from those of the type specimen: they are opposite, semicoriaceous, smaller (30 mm long, 15 mm wide), with obtuse tips and petioles just 2–3 mm long. Further collections from the northwestern departments of Peru may eventually show that these specimens belong to a different taxon from *F. cestroides*, but one that is related to it.

3. *Fuchsia chloroloba* Johnston, J. Arnold Arbor. 20: 243. 1939. TYPE: Peru. Dept. Cuzco: Prov. Paucartambo, Pillahuata, Cerro de Cusilluyoc, 2,200–2,400 m, 3–6 May 1925, *Pennell* 13973 (holotype, GH, photograph at NY; isotypes, F, NY, PH). Figure 12.

Fuchsia tuberosa sensu Macbride, Publ. Field Mus. Nat. Hist., Bot. Ser. 13: 564. 1941, pro parte.

Fuchsia tuberosa Krause var. *typica* sensu Munz, Proc. Calif. Acad. Sci., Ser. 4, 25: 76, pl. 12, fig. 66. 1943, pro parte.

Shrubs 1–2 m high, usually growing in rocks or epiphytic on trees, with globose to ellipsoid tubers 1–4 cm thick. Branchlets terete, smooth, purplish, 1.5–5 mm thick; older stems 0.5–2 m long, 5–18 mm thick, with freely exfoliating bark. Leaves alternate, usually lacking at anthesis, membranous, narrowly lance-ovate, 60–120 mm long, 20–55(–60) mm wide, apex acuminate, base

cordate to subcordate, glabrous on both sides; margin subentire to remotely denticulate, secondary veins 5–9 on either side of the midvein. Petioles 14–45 mm long. Stipules filiform, ca. 2 mm long, 0.2–0.3 mm wide, deciduous. Flowers few to numerous, axillary or clustered at the tips of young shoots. Pedicels dull red or green, 26–60(–70) mm long. Ovary (narrowly) cylindric, 10–24 mm long, 2–4 mm wide, lustrous light green. Floral tube (38–)41–51 mm long, 4–5 mm wide and bulbous at the base, thereupon strongly constricted to 1.5–2 mm wide in the lower $\frac{1}{3}$ – $\frac{1}{4}$ of the tube, then abruptly widened until 10–13.5 mm wide in the upper half before narrowing slightly to 9–11(–12) mm wide at the rim, glabrous outside, pilose inside in the lower $\frac{1}{4}$. Sepals lance-ovate, thin membranous, 16–24 mm long, 5–10(–12) mm wide, apex acute to acuminate, connate for 5–7 mm at the base, tetragonous in bud, spreading-divergent at anthesis. Tube glaucous, bright scarlet to light orange-pink, sepals parrot green. Nectary 6–8 mm high. Filaments green, the antesealous ones 10–16 mm long, the antepetalous ones 8–13 mm long; anthers oblong, yellow, 4–5 mm long, 2–3 mm wide. Style pale green, pilose inside in the lower $\frac{1}{3}$; stigma clavate, green, 4–4.5 mm long, ca. 2 mm wide, exerted 5–15 mm beyond the anthers. Mature berry not seen. Gametic chromosome number, $n = 11$.

Distribution. Southern Peru, endemic to cloud forest in several valleys in Prov. Paucartambo and Prov. Quispicanchis, Dept. Cuzco, (1,600–) 2,200–2,800 m. Flowers in the dry season, principally from May to October. Figure 11.

Specimens examined. PERU. CUZCO: Prov. Paucartambo, just above Buenos Aires, Km 131–132 on Cuzco-Paucartambo-Pilcopata road, *Berry et al.* 2599 (MO—2 sheets); Km 120 from Cuzco to Pilcopata, just above upper tunnel, *Berry et al.* 3008 (MO—2 sheets); Prov. Quispicanchis, above Marcapata, 92 km from Ocongate, *Berry & Aronson* 3015 (MO, USM), 3024 (MO, USM); 2 km below Opispatá, near Marcapata, *Berry & Aronson* 3017 (MO, USM), *Metcalf* 30719 (A, MO, UC, US), *Rauh* P1282 (RSA), *Vargas* 6214 (CUZ), 16567 (CUZ), *Wasshausen & Encarnación* 783 (MO); Prov. Paucartambo, Tambomayo, *Vargas* 60 (CUZ—2 sheets, F, MO); Pillahuata, Paso del Aguila, *Vargas* 16764 (CUZ), 22997 (MO); Prov. Paucartambo, Achirani, Marcachea, *Vargas* 1625 (CUZ, MO); between Achirani and Medias-Mayu, *Vargas* 11116 (A, F, G-DEL, K, NA, UC); Cosuepata, Prov. Paucartambo, *Velarde* 1197 (RSA); Prov. Paucartambo, Río Tambomayo, from Pillahuata Bridge to head of Tambomayo Grande; *West* 7094 (GH, MO—2 sheets). CULTIVATED: Berkeley, California, Univ. California Bo-

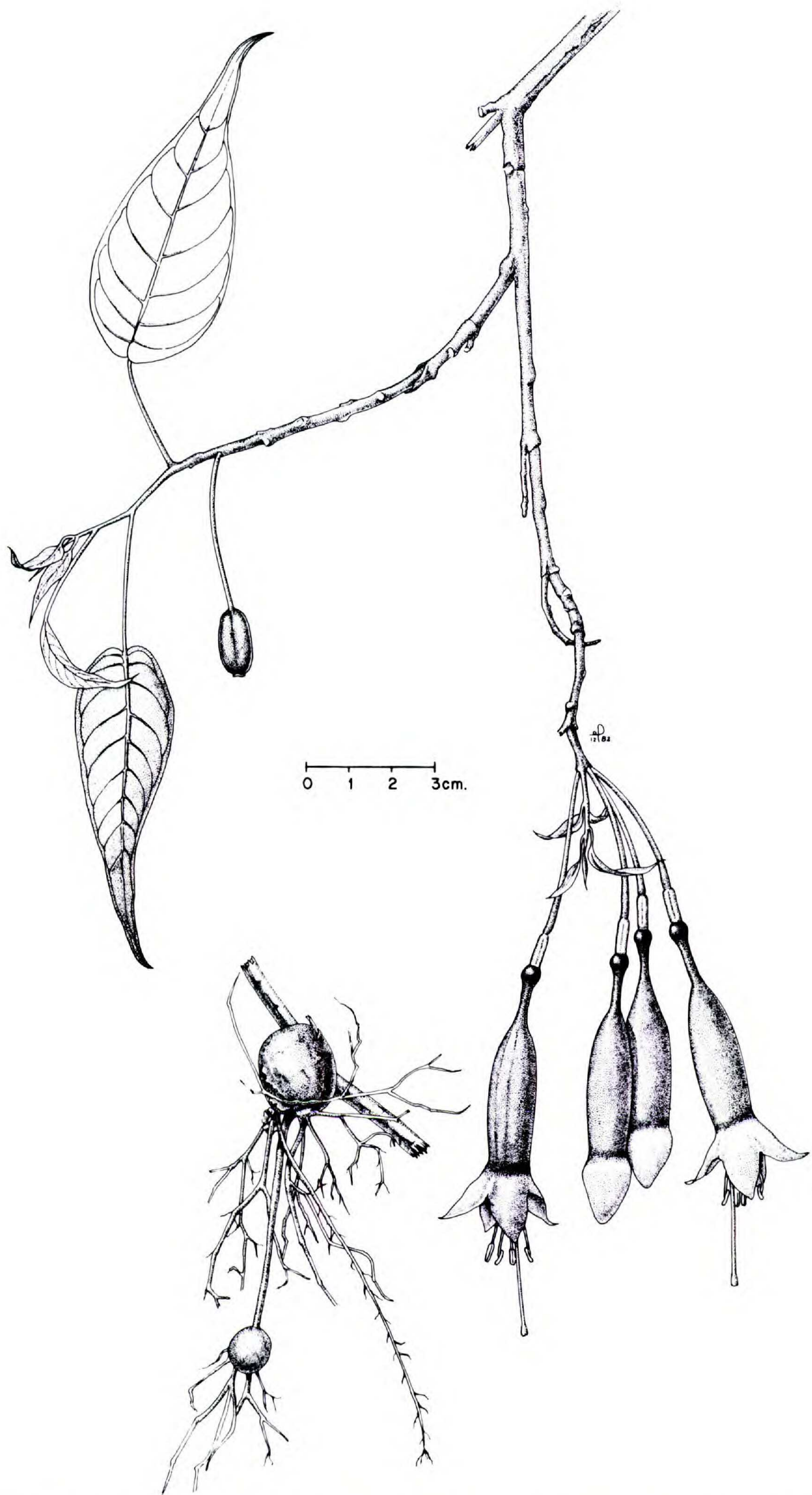


FIGURE 12. *Fuchsia chloroloba*, leafy and flowering branch from Wasshausen & Encarnación 783, Prov. Quispicanchis, Dept. Cuzco, Peru; tubers from Berry et al. 2599, Prov. Paucartambo, Dept. Cuzco, Peru.

tanical Garden Accession N° 36.1901, from seed of *West 7094*, in 1939 (UC).

This is a very localized and distinctive species, characterized by its short, tubular floral tubes with a very marked constriction in the lower third and a very striking color pattern, with glaucous, orange floral tubes and parrot green sepals. *Fuchsia chloroloba* is highly seasonal, forming well-developed tubers and flowering in the dry season, when most of the leaves are absent. This species has been confused by Munz (1943) with *F. inflata*, with which it grows sympatrically above Marcapata in Prov. Quispicanchis. The latter species has a similar floral tube shape, but the flowers are much longer (without apparent intergradation) and are reddish pink instead of orange, with the sepals less entirely green, as in *F. chloroloba*. Nonetheless, it is possible that natural hybrids occur between the two taxa, as described in the section on Sympatry and Hybridization.

4. *Fuchsia garleppiana* Kuntze & Wittmack, *Gartenflora* 42: 461, fig. 96. 1893. Munz, *Proc. Calif. Acad. Sci.*, Ser. 4, 25: 82, pl. 14, fig. 72. 1943. TYPE: Bolivia. Dept. Cochabamba: cloud forest at Cocapata, Tunari Range, 3,000 m, Apr. 1982, *Kuntze* (holotype, NY; isotypes, F-297181, F-297182, NY, photographs of F-297182 at NY, UC). Figure 13.

Shrubs 0.5–4 m tall, growing epiphytically or more commonly out of rock crevices, with strongly developed cylindrical tubers 10–80 cm long and 2–4 cm thick and more or less erect branches 1–2.5 m long. Young growth densely white-pilose; branchlets terete, 2–4 mm thick, red-green; older stems 4–10 mm thick, with freely exfoliating bark. Leaves alternate, usually absent at anthesis, membranous, ovate to elliptic-ovate, mature blades 90–130 mm long, 55–75 mm wide, apex subacuminate, base rounded to cordate, light green and subglabrous above, pilose along veins and margin below; margin subentire to remotely denticulate, secondary veins 9–10 on either side of the midvein. Petioles pilose, 40–73 mm long on mature leaves. Stipules filiform, ca. 2 mm long, deciduous. Flowers few to many, axillary or grouped at branch tips. Pedicels densely pilose, greenish pink, 7–30(–60) mm long. Ovary narrowly cylindric, 7–8 mm long, 2–2.5 mm thick, densely pilose. Floral tube narrowly tubular-funnelform, (45–)70–140 mm long,

3.5–6(–7) mm wide and bulbous at the base, then constricted to 2–2.5 mm wide and gradually widened above until 7–10 mm wide below the slightly constricted mouth, pilose outside, villous inside for most of length. Sepals lance-ovate, 10–18 mm long, 5.5–7(–8) mm wide, apex acute, connate for ca. $\frac{1}{3}$ of length at the base, spreading-divergent at anthesis. Tube and sepals light to very pale pink, with a dark purple ring on the throat where the stamens are inserted. Nectary lustrous green-purple, 4–6 mm high. Filaments green, the antesealous ones 10–12 mm long, the antepetalous ones 8–9 mm long; anthers yellow, 3–4 mm long, 1.5–2 mm wide. Style light pink, villous for most of length; stigma green, globose, 2–2.5 mm long, 2.5–3 mm wide. Young berries narrowly cylindric, ca. 22 mm long, ca. 4 mm wide. Gametic chromosome number, $n = 11$.

Distribution. Endemic to cloud forest in Dept. Cochabamba, Bolivia, at 2,500–2,950 m. Flowers principally in the dry season, when leafless, from (March to) April to August. Figure 10.

Specimens examined. BOLIVIA. COCHABAMBA: Prov. Chapare, 54 km towards Villa Turari, *Beck 1414* (MO—2 sheets); 41–42 mi. from Cochabamba to Chapare, *Berry & Berry 2582* (MO—2 sheets); *2583* (MO—2 sheets), *2590* (MO); 5 km from Incachaca on old road to Aguirre, *Berry 3635* (MO). Incachaca, road to Aguirre, *Brooke 6741* (BM, F, G-DEL, NY, S, U); Incachaca, *Cárdenas 688* (US); near Chulumani, way to Yungas de Tablas, *Cárdenas 6279* (NY, US); way to Río Chulumani, mule path to Yungas de Tablas, *Cárdenas s.n.* (POM); Incacorral-Aduana, *J. Steinbach 9538* (BM, F, G-DEL, GH, K, MO, NY, PH, S, U, Z).

Of all the native Bolivian fuchsias, *F. garleppiana* is the only one with floral tubes over 7 cm long. It is also characterized by the very pale pink coloration of the flowers, the dense white-pilose pubescence on the young growth, and its primarily shrubby habit. Although this species has well-developed, cylindrical tubers and flowers in the dry season when it is leafless, it is rarely truly epiphytic; rather, it prefers exposed rocks, from which erect stems to 1 m tall emerge. Only two other species of *Fuchsia*, both from Peru, can have similarly long flowers; *Fuchsia apetala* is basically epiphytic or terrestrial at higher elevations, with creeping, tortuous stems and reddish orange flowers. *Fuchsia inflata*, the other species with long floral tubes, sometimes has a habit similar to that of *F. garleppiana*, but its floral tubes are pink-orange, much more constricted at the base and broader at the top, and it has yellow-green sepals.

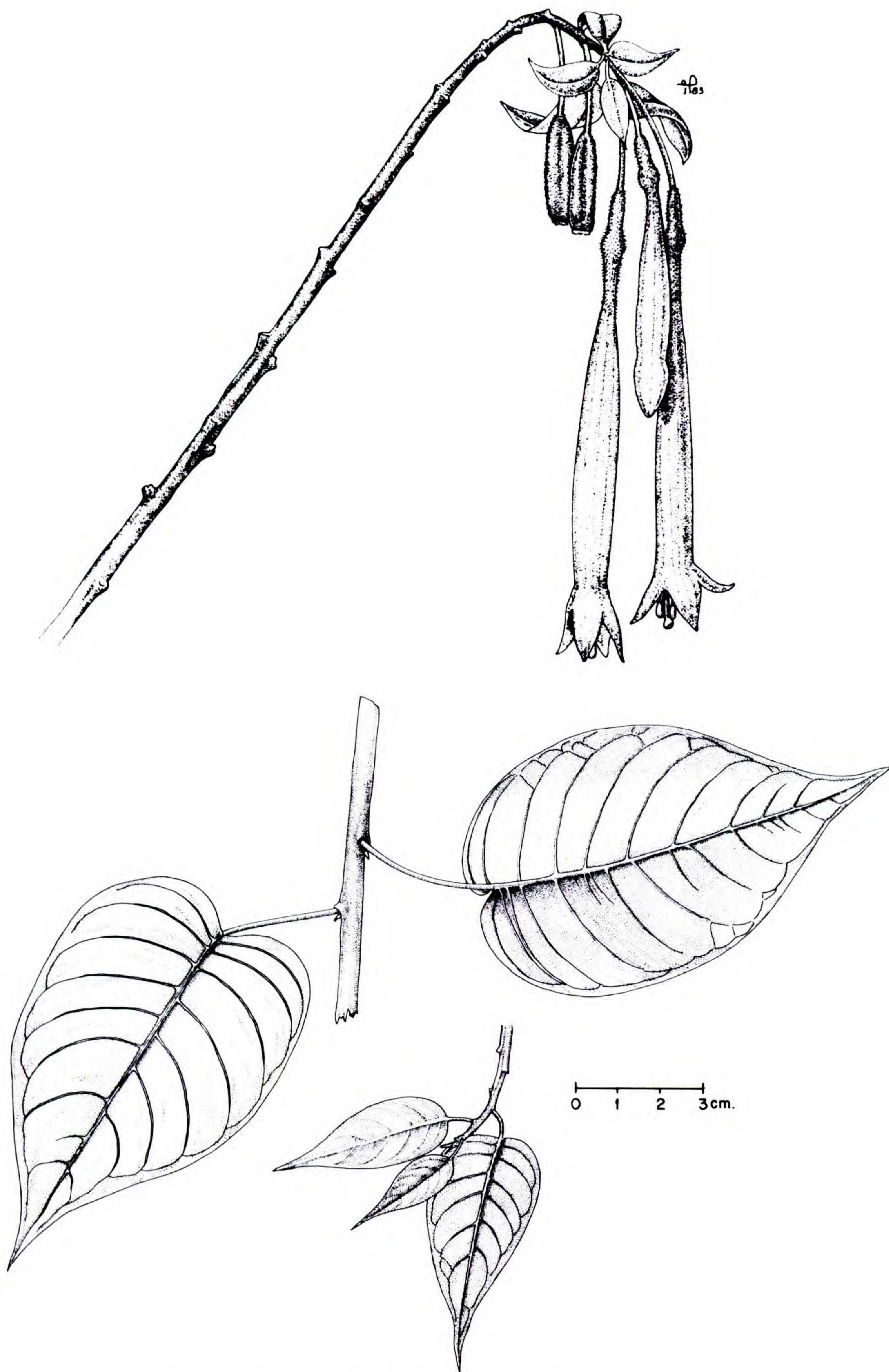


FIGURE 13. *Fuchsia garleppiana*, flowering branch from *Berry & Berry* 2583, Dept. Cochabamba, Bolivia; leaves from *Beck* 1414, Dept. Cochabamba, Bolivia.

5. *Fuchsia huanucoensis* P. Berry, sp. nov. TYPE: Peru. Dept. Huánuco: Carpish Divide, Chinchao Valley, 8,500 ft., Oct. 1945, *Sandeman* 5166 (holotype, K; isotypes, K, OXF).

Frutex scandens, ramis oppositis. Folia coetanea, opposita, firme membranacea, anguste elliptico-ovata, apice subacuminata, basi acuta vel rotundata, 40–80 mm longa, 18–30 mm lata, petiolis 6–10 mm longis. Flores pauci axilaresque ad apicem ramorum, pedicellis gracilibus cernuis 24–35 mm longis. Tubi florales anguste infundibuliformes, 31–34 mm longi, basi ca. 3.5 mm lati inde gradatim dilatati summo ca. 7 mm lati. Sepala anguste lanceolata, apice anguste acuta vel acuminata, 22–23 mm longa, 4–5 mm lata, basi connata 2–3 mm limbis sub anthesi valde patentibus.

Low, scandent shrubs with oppositely branched stems. Branchlets subterete, 1–3 mm thick, purplish, pilose with white hairs; older branches pilose, with lustrous purple bark splitting longitudinally. Leaves present at anthesis, opposite, firmly membranous, narrowly elliptic-ovate, 40–80 mm long, 18–30 mm wide, apex subacuminate, base acute to rounded, apparently dark green and subglabrous above, paler below with pilose midvein and margin; margin subentire, secondary veins 6–10 on either side of the midvein. Petioles strigose, purplish, 6–10 mm long. Stipules lance-triangular, 1–1.5 mm long, deciduous. Flowers few and axillary, close to the branch tips. Pedicels slender, drooping, sparsely pilose, 24–35 mm long. Ovary oblong, 6–7 mm long, ca. 3 mm wide. Floral tube narrowly funnelform, 31–34 mm long, ca. 3.5 mm wide at the base, then gradually widened above until ca. 7 mm wide at the rim, subglabrous outside, pilose inside in lower ½. Sepals narrowly lanceolate, apex narrowly acute to acuminate, 22–23 mm long, 4–5 mm wide, connate for 2–3 mm at the base, tips strongly spreading or recurved at anthesis. Tube and sepals magenta or bright reddish pink. Nectary ca. 3 mm high. Filaments reddish, the antesepalous ones 13–20 mm long, the antepetalous ones 9–14 mm long; anthers narrowly oblong, 3–4 mm long, ca. 2 mm wide. Style reddish, pilose for most of length; stigma subclavate, barely 4-cleft at the apex, ca. 2 mm long, ca. 1.5 mm wide. Berry not seen.

Distribution. Central Peru, known only from the type locality in cloud forest at the Carpish Divide, Dept. Huánuco, 2,750–2,950 m. Is known to flower from October to November. Figure 11.

Specimen examined. PERU. HUÁNUCO: Carpish, 9,000 ft., *Sandeman* 3480 (K).

This species is allied to *F. juntasensis*, *F. membranacea*, and *F. tillettiana*, by virtue of its fruticose habit, opposite and narrowly ovate leaves, apparent lack of tubers, medium length flowers, and reflexed sepals. It is readily distinguished from these species, however, by its firmer, narrower leaves, with sparse pilose pubescence, narrowly lanceolate sepals, and disjunct distribution. *Fuchsia huanucoensis* is apparently very rare, as the Carpish area has been relatively well collected by botanists.

6. *Fuchsia inflata* Schulze-Menz, Notizbl. Bot. Gart. Berlin-Dahlem 15: 136. 1940. *Fuchsia tuberosa* Krause var. *inflata* (Schulze-Menz) Munz, Proc. Calif. Acad. Sci., Ser. 4, 25: 77. 1943. TYPE: Peru. Dept. Cuzco: Prov. Paucartambo, above Cosñipata, between Tambob Tres Cruces and Tambomayo, 3,100 m, 25 Apr. 1914, *Weberbauer* 6935 (holotype, B, destroyed in World War II; isotypes, F—2 sheets, GH, POM, US—2 sheets). Figures 1–4, 14.

Fuchsia macrantha sensu Munz, Proc. Calif. Acad. Sci., Ser. 4, 25: 83, pl. 14, fig. 73. 1943, pro parte.

Shrubs 1–3 m high, usually growing among rocks, or epiphytic on trees, with well-developed, cylindrical, tan tubers 2–50 cm long and 2–4 cm thick. Branchlets terete, 2–5 mm thick, tan to reddish, glabrous to densely cinereous or velutinous; older stems erect to divergent and 1–3 m long, 4–12 mm thick, with freely exfoliating bark. Leaves alternate or rarely opposite, membranous, narrowly elliptic to ovate, 55–135 mm long, 20–52 mm wide, apex acuminate, base acute to rounded or subcordate, glabrous to sparsely pubescent above, glabrous to pubescent along the veins below; margin subentire to remotely denticulate, secondary veins 6–9 on either side of the midvein. Petioles glabrous to canescent-velutinous, 12–22(–35) mm long. Stipules filiform, 1.5–2 mm long, deciduous. Flowers axillary, one or few to numerous, usually densely clustered at branch tips. Pedicels pale green to reddish, 20–55(–70) mm long, glabrous to densely pubescent. Ovary ellipsoid to narrowly cylindrical, 8–18 mm long, 2–3 mm wide, subglabrous to densely cinereous, sometimes 8-sulcate. Floral tube 85–120 mm long, 5–9 mm wide and strongly bul-

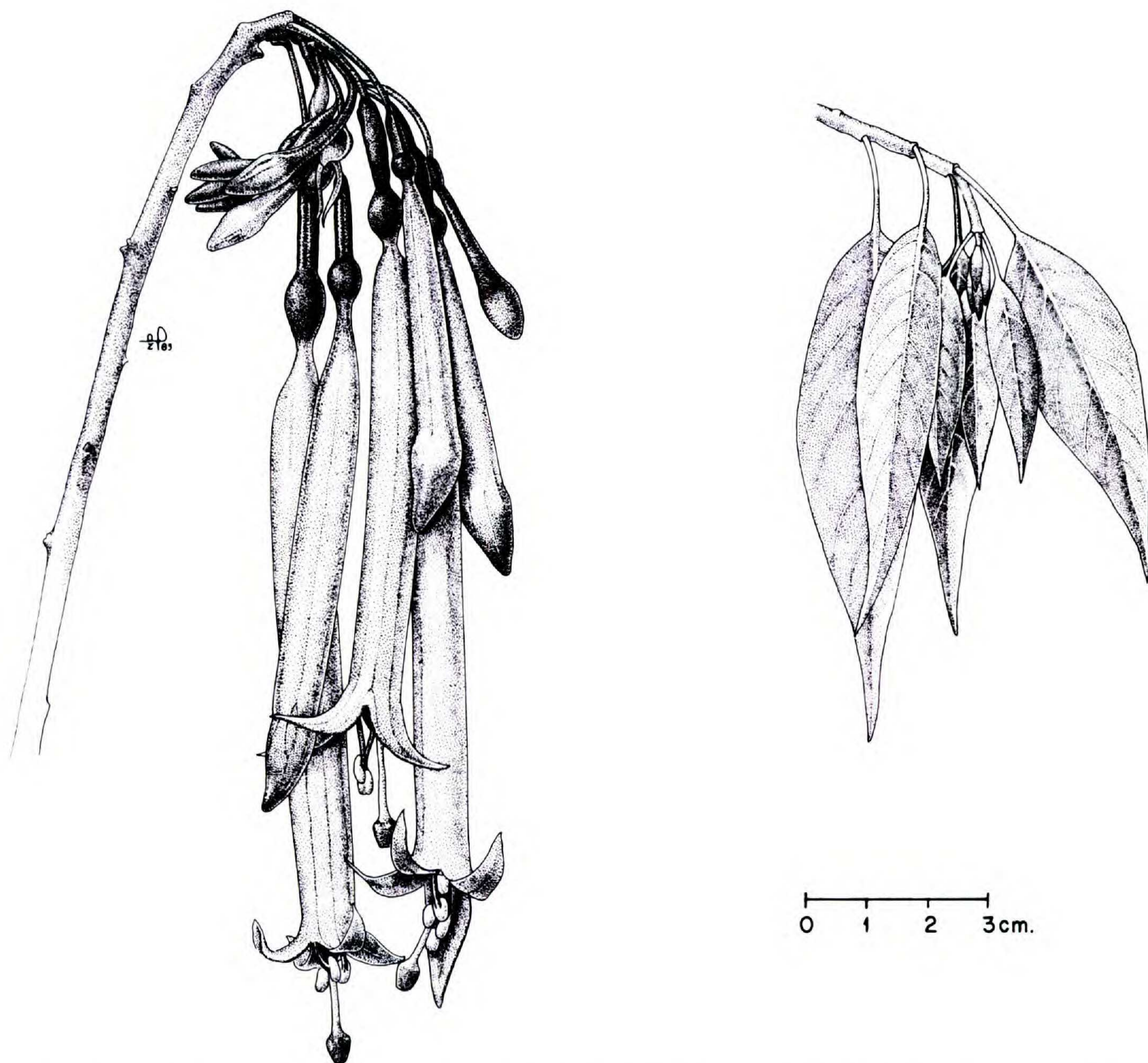


FIGURE 14. *Fuchsia inflata*, flowering branch from Berry & Aronson 3036, Prov. La Convención, Dept. Cuzco, Peru; leaves from Vargas 23044, Prov. Calca, Dept. Cuzco, Peru.

bous at the base, strongly constricted to 2–4 mm wide above the nectary, then abruptly widened to (8–)10–14 mm wide in the upper part of the tube, slightly constricted to 7–12 mm wide at the mouth, glabrous to densely canescent or pilulose outside, pilose inside on lower $\frac{1}{3}$. Sepals narrowly triangular to lanceolate, 15–26 mm long, 6–10 mm wide, apex acute, connate for 4–10 mm at the base, somewhat recurved at anthesis or divergent in lower $\frac{1}{2}$ and suberect in upper $\frac{1}{2}$. Tube (light) pink to orange, the base greenish or dull purple around the nectary, sepals light green to dull yellow-green. Nectary 3–5 mm high. Filaments green to pale yellow-green, the antesealous ones 15–20 mm long, the antepetalous ones 8–16 mm long; anthers (narrowly) oblong, yellow, 4–5 mm long, 2–3.5 mm wide. Style green

to white-yellow, villous in lower $\frac{1}{2}$ or for most of length; stigma green, clavate to globose, sometimes tetragonous, 4-cleft at the apex, ca. 4 mm long, 2–3 mm wide. Young berries 20–40 mm long, 5–6 mm wide. Gametic chromosome number, $n = 11$.

Distribution. Dept. Cuzco, Peru, endemic to several valleys on the eastern slopes of the Andes, (2,350–)2,850–3,600 m. Flowers principally in the dry season, from June to August. Figure 11.

Specimens examined. PERU. CUZCO: Prov. Convención, Km 145–146 from Cuzco to Quillabamba, Berry & Berry 2567 (MO), 2568 (MO), 2569 (MO), 2570 (MO), Berry & Aronson 3036 (MO, USM), 3037 (MO), 3038 (MO, USM), Gentry 19830 (MO); Km 150 on Cuzco-Quillabamba road, Berry & Aronson 3040 (MO); Km 156 on Cuzco-Quillabamba road, Berry &

& Berry 2572 (MO); Prov. Quispicanchis, Km 88–92 from Ocongate to Marcapata, *Berry & Aronson* 3010 (MO), 3011 (MO), 3012 (MO), 3013 (MO), 3016 (MO); across river from Marcapata, *Berry & Aronson* 3023 (MO—2 sheets); Quillabamba, Sta. Teresa, 0.5 km W of La Playa at Mandornilloc, *Peyton & Tilney-Peyton* 1274 (MO); Rio Marcapata, *Rauh & Hirsch* P1308 (RSA); Prov. Calca, around Lares, *Vargas* 3595 (BH—2 sheets); Prov. Calca, Amparaes, *Chávez* 3273 (MO), *Vargas* 23044 (MO); Prov. Convención, Lucumayo Valley, *Cook & Gilbert* 1312 (US); Prov. Calca, near Lares, *Vargas* 3584 (BH, CUZ, MO), 3595 (BH, CUZ); Prov. Convención, Yanamache-Lucumayo, *Vargas* 4451 (CUZ—2 sheets); near town of Marcapata, *Vargas* 11687 (CUZ); Prov. Calca, between Amparaes and Km 68, *Vargas* 15581 (CUZ); Prov. Urubamba, above ruins of Machupichu, *Vargas* 19901 (CUZ); without locality, *Weddell*, 1847 (F); Yanatili, *Weibel*, 1976 (USM). CULTIVATED: Berkeley, California, flowering in summer of 1940, *Univ. Calif. Botanical Garden Accession* N° 38.1052, from Dept. Cuzco, Peru (UC).

A complex pattern of variation occurs in the long-tubed plants of sect. *Hemsleyella* that inhabit a series of adjacent valleys to the north, east, and west of the city of Cuzco, in southern Peru. An adequate understanding of the intra- and interpopulational variability of this group, here treated as belonging to one species, *F. inflata*, has not been possible, because of the scarcity of these plants, their strong seasonality and an insufficient sampling of the populations in each of the valleys.

In general, the specimens treated here under *Fuchsia inflata* can be distinguished by their floral tubes 8–12 cm long, with a bulbous base around the nectary, followed by a narrow constriction before forming a tube that tapers slightly towards the rim. Unlike *F. apetala* and *F. garleppiana*, the only other species in the genus that can have such long-tubed flowers, the sepals of *F. inflata* are mostly green, and the leaves are much narrower than either of the other species. Furthermore, only *F. apetala* has knotty-tortuous stems, and *F. garleppiana* alone has pale pink flowers. Macbride (1941) and Munz (1943) treated specimens of *F. inflata* as long-tubed variants of *F. tuberosa*, for which both of them refer to plants presently recognized as *F. chloroloba*. Although *F. chloroloba* and *F. inflata* can occur sympatrically, and both have marked floral tube constrictions, the floral tubes of the former are quadrangular in cross section, and the tubes never exceed 55 mm in length, while the sepals are entirely parrot green and the tubers are smaller and more spherical than the elongate ones of *F. inflata*.

The type collection of *F. inflata* is the only

specimen of this group collected in the Paucartambo Valley, which is in the central part of the range of the species; that specimen is glabrous throughout and bears both opposite and alternate leaves. Other collections agreeing with the type description and the characters noted previously occur to the southeast, along the Río Marcapata. However, in a series of collections made on July 21, 1978 along the Río Marcapata, 88–92 km from Ocongate, at elevations between 3,000 and 3,280 m, considerable differences in flower color, floral tube shape, and leaf size and shape were found among long-tubed plants most closely agreeing with *F. inflata*. *Berry & Aronson* 3010 and 3011 were found just meters apart at 3,280 m, in full sun among rocks and boulders above the river (see Fig. 4); 3010 had green sepals and light pink floral tubes sharply constricted at the base but broad above and was leafless, whereas 3011 had numerous large leaves, yellowish sepals and much narrower, less constricted floral tubes. Fifty meters downriver, *Berry & Aronson* 3013 had flowers similar in shape to 3010, but with salmon orange floral tubes. At 3,120 m, 1 km below 3013, an odd plant with floral tubes 50 mm long and with knotty stems similar to *F. apetala* was found, *Berry & Aronson* 3014. Just 20 m below, *F. chloroloba* appeared. Chromosome counts were obtained from several of these plants, yielding $n = \text{ca. } 22$ for 3010, $2n = 44$ and $n = \text{ca. } 22$ for 3011, $2n = 22$ for 3014, and $n = 11$ for 3015. Anaphase I of pollen mother cells in 3011 showed meiotic irregularities such as bridges and chromosome fragments. It is unclear what is occurring in this area, but some hybridization may have resulted among entities assignable to *F. inflata*, *F. chloroloba*, and possibly *F. apetala*.

The remaining specimens cited here under *F. inflata* come from valleys further to the northwest, in the Provinces Calca and La Convención (with a single collection from Prov. Urubamba). Although they all have leaves and floral tubes similar in size and shape to the plants described as “typical” for this species, they differ noticeably in their much longer, slender ovaries (to 4 cm long in fruit) and in the presence of a fine, ashy canescent pubescence on leaves, stems, and flowers, including the interior of the sepals in some cases. In addition, both the ovaries and the bulb around the nectary are sometimes 8-ridged and purplish. As in the populations from Prov. Quispicanchis, however, flower color varies from pink tubes with yellowish sepals (*Berry & Berry* 2567)

to bright orange tubes with mostly light green sepals (*Berry & Berry* 2570, 2572, and 3036). Two collections examined from this area were both diploid (*Berry & Aronson* 3036 and 3040). Clearly, further cytological information from different populations will be very useful in clarifying the systematics of the *F. inflata* complex.

7. *Fuchsia insignis* Hemsley, J. Bot. 14: 69. 1876.

TYPE: Ecuador. Provinces Cañar and Chimborazo: in mossy forest on W slopes of Mt. Azuay, 23–26 Aug. 1859, *Spruce* 5976 (lectotype, K—Bentham Herbarium, here designated; isoelectotypes, BM, CGE, F, G-BOIS, G-DC, K—Hooker Herbarium, LE, NY, OXF, P—2 sheets, W—3 sheets).

Fuchsia apetala sensu Munz, Proc. Calif. Acad. Sci., Ser. 4, 25: 80, pl. 13, fig. 69. 1943, pro parte.

Scandent or epiphytic vines or shrubs climbing high into trees, or terrestrial shrubs ca. 1 m high. Branchlets smooth, purplish, pilose, 2–5 mm thick, with prominent, alternate leaf scars; older stems freely exfoliating in strips, with stoloniferous runners. Leaves alternate, absent when flowering, membranous, ovate to broadly elliptic-ovate, just two young leaves seen, these 45–90 mm long, 30–40 mm wide, apex acute, base rounded, green and subglabrous above, pale green to purplish and villous below, especially along the veins; margin subentire to remotely denticulate, secondary veins 6–7 on either side of the midvein. Petiole 1–1.5 mm thick, 9–18 mm long. Flowers few to numerous and clustered at the tips of new shoots. Pedicels pilose, 10–23 mm long. Ovary narrowly cylindrical, pilose, 8–10 mm long, 2–3 mm wide. Floral tube funnelform, (38–)40–54(–62) mm long, 4–6 mm wide and bulbous at the base, constricted to 2–2.5 mm in lower $\frac{1}{3}$, then gradually widened until 7–11 mm wide at the rim, pilose outside and inside in lower $\frac{1}{3}$. Sepals oblong-lanceolate, 24–37 mm long, 7–12 mm wide, usually widest in the middle, apex acute to obtuse, connate for 3–4 mm at the base, strongly recurved at anthesis. Tube and sepals bright scarlet or orange-red. Nectary 4–6 mm high. Filaments green (fide *Rose & Rose* 22230), the antesepalous ones 30–40 mm wide, the antepetalous ones 25–35 mm long; anthers oblong, 4–5 mm long, 2–2.5 mm wide. Style densely retrorse villous in the lower $\frac{1}{3}$, exerted 10–15 mm beyond the anthers. Stigma globose, ca. 2 mm long and wide. Immature berry narrowly cylindrical, verrucose, 18–20 mm long, 5–7 mm wide.

Distribution. Southern Ecuador; scarce epiphytes in cloud forest or shrubs on hillsides in Provinces Bolívar, Chimborazo, and Cañar, 2,000–3,240 m. Flowers in the dry season when leafless, mostly from July to October. Figure 15.

Specimens examined. ECUADOR. BOLÍVAR: Chaparro de Gualicón Loma, Cordillera Occidental, *Acosta Solis* 6267 (F). CAÑAR: between Cuenca and Huigra, *Hitchcock* 21701 (GH, NY, US). CHIMBORAZO: Sibatambe, Hda. La Carmela, Sección Era-Pata, Cordillera Occidental, *Acosta Solis* 5454 (F); Province of Alausí at 10,000 ft., *Jameson*, 1836 (K); vicinity of Huigra, mostly on Hda. de Licay, *Rose & Rose* 22230 (GH, NY, US). WITHOUT PROVINCE: near top of the Cuesta de Angas, on road to Guayaquil, 2 Aug. 1848, *Jameson* s.n. (K); “found in the forest of Camino Real,” 8,000 ft., July 1848, *Jameson* s.n. (K); Andes of Ecuador, 9,000 ft., *Pearce* s.n. (K), *Lobb* 112 (K).

This species is best distinguished by its unusually large, reflexed sepals and long filaments. It is strongly deciduous, but the presence of tubers in this species has not been noted. No collections of *F. insignis* have been made since 1943, probably a reflection of the destruction of large areas of natural habitat for this species, as well as a possibly brief flowering period and the inaccessibility of the remaining habitats.

8. *Fuchsia juntasensis* O. Kuntze, Revis. Gen. Pl. 3(2): 97. 1898. Munz, Proc. Calif. Acad. Sci., Ser. 4, 25: 77, pl. 12, fig. 67. 1943. TYPE: Bolivia. Dept. Cochabamba: between Cochabamba and Río Juntas, E side of Cordillera, 3,000 m, *Kuntze* (lectotype, NY, here designated). Figure 16.

Fuchsia steinbachii Johnston, Contr. Gray Herb. 75: 38. 1925. TYPE: Bolivia. Dept. Cochabamba: Prov. Chapare, open woods at Incachaca, 2,500 m, 22 Oct. 1920, *Steinbach* 5038 (holotype, NY, photograph, UC; isotypes, A, G-DEL).

Terrestrial or commonly epiphytic shrubs 0.5–1.5 m tall, occasionally with small tubers. Young branches purplish, terete, 1–2 mm thick; older branches 4–20 mm thick with bark turning tan and exfoliating in strips or flakes. Leaves opposite or less often ternate, membranous, (narrowly) ovate, 35–110 mm long, 15–50 mm wide, apex acuminate, base acute to rounded, glabrous to sparsely puberulent when young, often purplish below; margin subentire to serrulate, secondary veins 5–7 on either side of the midvein. Petioles 5–9 mm long. Stipules triangular to lanceolate, 2–3 mm long, 1.5–2.5 mm wide, occasionally connate. Flowers few, axillary or grouped

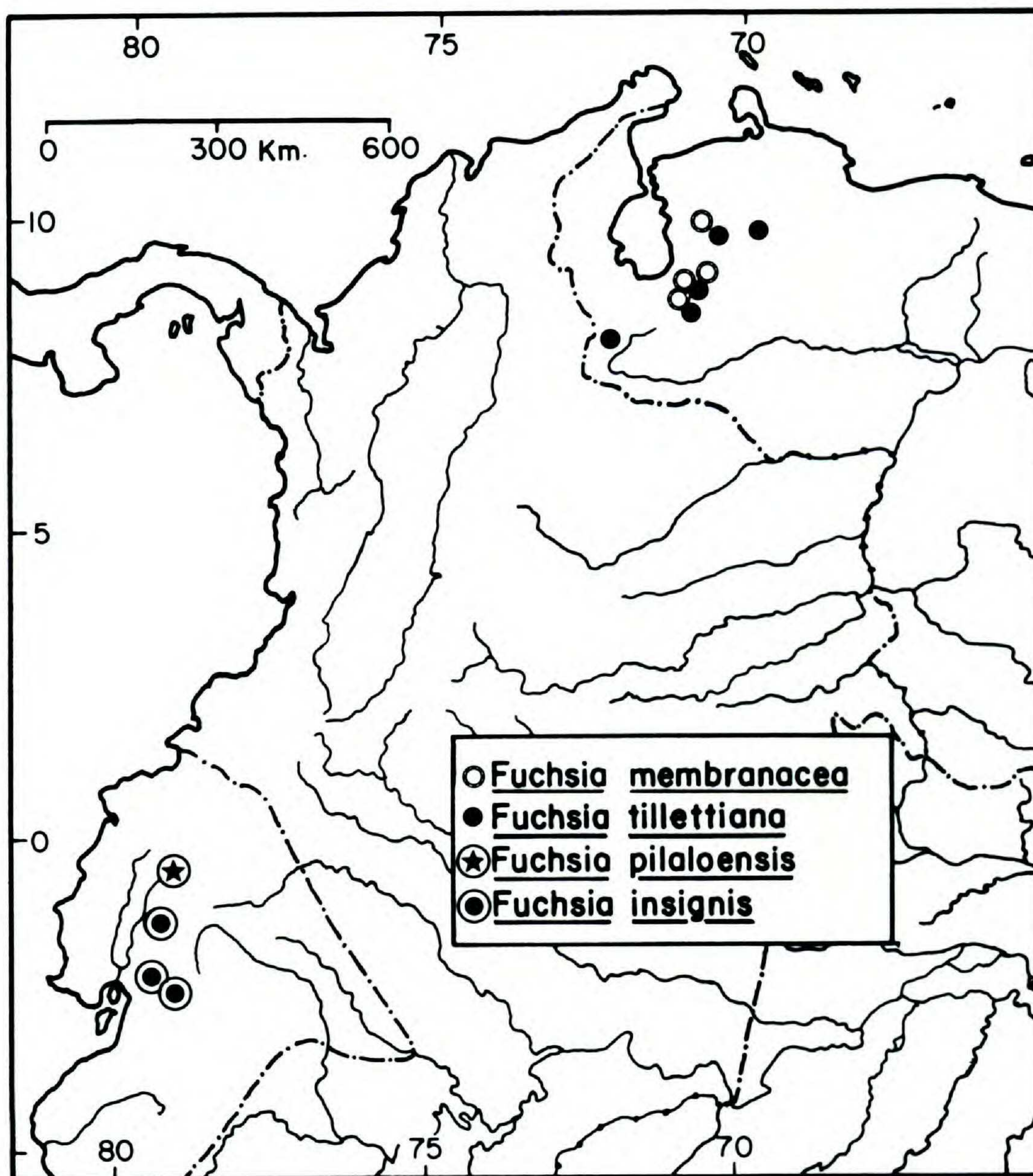


FIGURE 15. Distribution of the Ecuadorian and Venezuelan species of *Fuchsia* sect. *Hemsleyella*.

at branch tips. Pedicels slender, 20–75 mm long. Ovary oblong, greenish, 5–10 mm long, 2–3 mm wide. Floral tube funnellform, 25–50 mm long, 2–4 mm wide at the base, slightly constricted in the lower $\frac{1}{3}$, then widened until 8–10 mm wide at the rim, glabrous outside, villous inside in the lower $\frac{1}{3}$ above the nectary. Sepals ovate-lanceolate, 14–25 mm long, 4–8 mm wide, apex acute to acuminate, connate for 3–4 mm at the base, divergent to recurved at anthesis. Tube and sepals deep lavender to rose violet. Nectary lustrous green to purplish, 4–5 mm high. Filaments purple, the antesealous ones 9–21 mm long, the antepetalous ones 6–16 mm long; anthers oblong, yellow, 3–4.5 mm long, 1.5–2.5 mm wide. Style light purple, villous for most of its length; stigma green, 2.5–4 mm long, 2–3 mm wide, 4-cleft at apex, exserted 4–8 mm beyond the an-

thers. Berry oblong, purplish, 16–18 mm long, 8–10 mm wide (immature). Gametic chromosome number, $n = 22$.

Distribution. Bolivia, restricted to cloud forest on the northeast slopes of the Andes in Dept. Cochabamba, 1,900–2,800 m. Flowers principally in the dry season, from June to October. Figure 10.

Specimens examined. BOLIVIA. COCHABAMBA: Valle de Montepunco, 1,900 m, *Adolfo* 380 (US); Valle de Corani, 800 m, *Adolfo* 417 (US); 44 mi. from Cochabamba to Chapare, *Berry & Berry* 2587 (MO), 2588A (MO); 4 km above Incachaca on old road to Aguirre, *Berry* 3634 (MO); above ENDE pumping station at Corani, *Berry* 3638 (MO—2 sheets); Incachaca, *Brooke* 6666 (BM, F, NY, U), 6666a (BM, F, NY, U), 6666c (BM, F, NY, U), *Cárdenas* 2248 (6H), *Werdermann* 2030 (MO, S); near Chulumani, road to Yungas de Tablas, *Cárdenas* 4089 (F, GH, RSA); cerros de In-

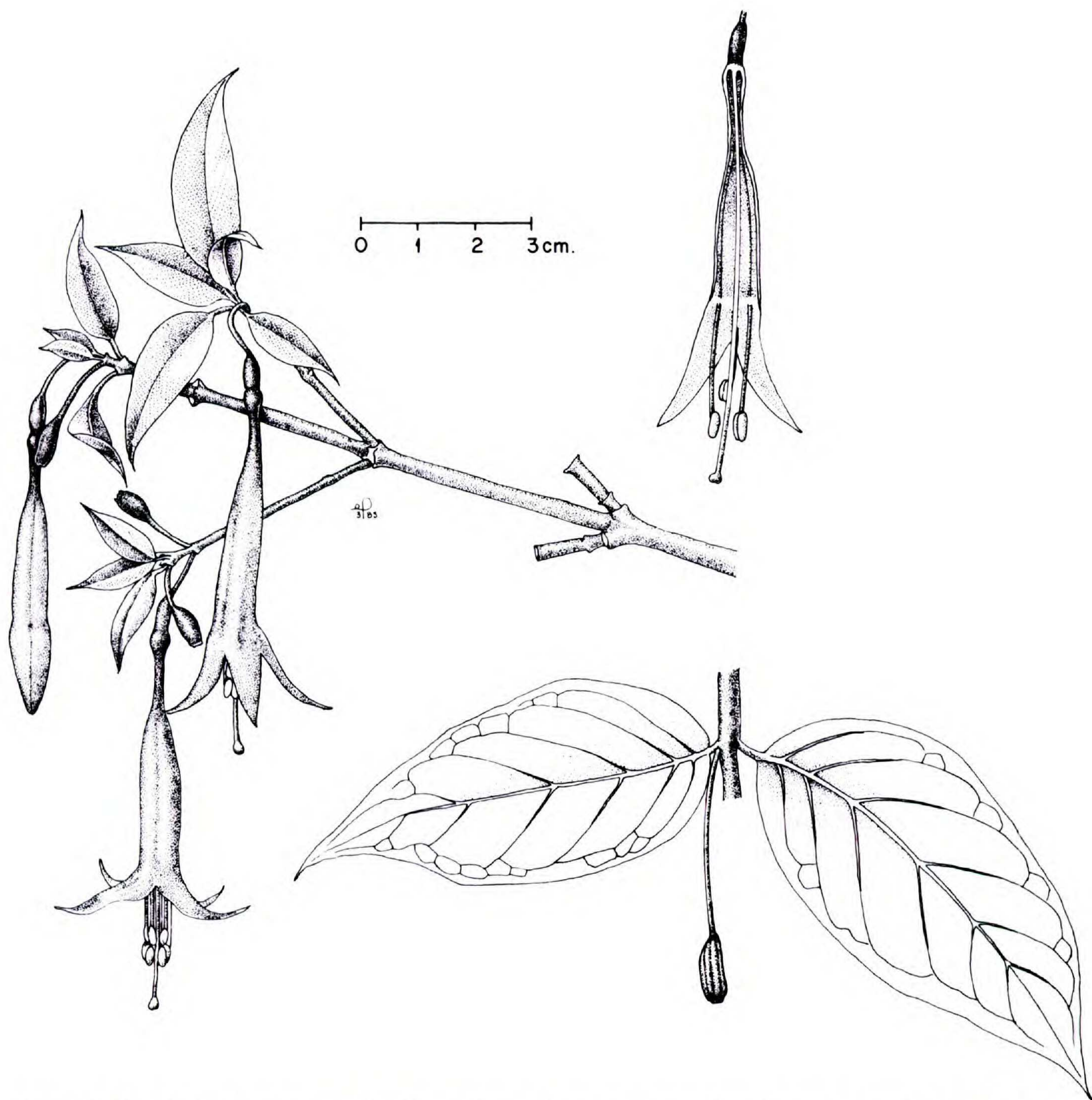


FIGURE 16. *Fuchsia juntasensis*, floral section and flowering branch from *Berry & Berry* 2587, Dept. Cochabamba, Bolivia; leaves from *Berry* 3638, Dept. Cochabamba, Bolivia.

cachaca, *Steinbach* 5738 (A, G-DEL, K); Quebrada de Corani, *Steinbach* 9862 (BM, F, G-BOIS, K, MO, NY, PH, S, U, UC, Z). WITHOUT LOCALITY: *Bridges* s.n. (BM).

This is one of the opposite-leaved species of sect. *Hemsleyella* with poorly developed tubers; it can be distinguished by its glabrous, mauve or violet-colored flowers, which generally have a lustrous green ovary, a shiny dark purple coloration around the nectary and slightly recurved, lance-ovate sepals. *Fuchsia juntasensis* is known only from the yungas of Dept. Cochabamba in Bolivia, where it occurs as a terrestrial shrub or as an epiphyte. As Brooke (1953) noted, plants

of this species found growing in the shade usually flower and produce leaves simultaneously.

A single chromosome count of $n = \text{ca. } 22$ was obtained from *Berry* 3638; curiously, pollen of the same collection is entirely biporate (Praglowksi et al., 1983), whereas most other tetraploid plants of *Fuchsia* examined show at least some triporate pollen grains. A possible intersectional hybrid between *F. juntasensis* and *F. denticulata* (sect. *Fuchsia*) is discussed in the section on Sympatry and Hybridization.

9. *Fuchsia membranacea* Hemsley, J. Bot. 14: 70. 1876. Munz, Proc. Calif. Acad. Sci., Ser.

4, 25: 78. 1943. TYPE: Venezuela. Edo. Mérida: Venta de Mucuchíes, June 1842, *Linden* 372 (holotype, K; isotypes, BM, CGE, G-BOIS, G-DC, MICH—fragment from G, MPU—2 sheets, OXF, P—2 sheets). Some labels incorrectly list Caracas, Venezuela as the type locality. Figure 17.

Terrestrial shrubs 1–2 m tall, sometimes climbing to 6 m above ground, growing in rocks, or epiphytic in trees to 10 m above ground; thickened roots to 20 mm thick or small tubers to 2 cm diam. sometimes present. Branchlets red-pink to dark purple, 2–5 mm thick, older stems 5–25 mm thick, with freely peeling, flaky, pale tan bark. Leaves opposite or ternate, sometimes subopposite, membranous, ovate-elliptic, 50–100 mm long, 18–50 mm wide, apex (sub-)acuminate, base rounded to acute, subglossy green and mostly glabrous above, pale green and subglabrous below; margin subentire to denticulate, secondary veins 6–8 on either side of the midvein. Petiole 10–35 mm long. Stipules lance-triangular, 2–2.5 mm long, 1–2 mm wide. Flowers 2–12 per shoot, axillary or grouped toward the branch tips. Pedicels slender, usually green, 30–55(–75) mm long. Ovary cylindrical, 6–7 mm long, 2–4 mm wide, lustrous green or rose-colored. Floral tube funnelform, (30–)36–51 mm long, 2.5–4 mm wide at base, narrowed slightly in lower $\frac{1}{3}$, then widened until 7–12 mm wide at the rim, mostly glabrous outside, pilose inside in lower $\frac{1}{3}$. Sepals ovate-lanceolate 17–25 mm long, 5–11 mm wide, apex acute, connate for 5–8 mm at base, lobes often split open before anthesis with stigma exserted, spreading at anthesis. Tube red-pink, sepals usually pale green in upper $\frac{1}{2}$. Nectary green, lustrous, 4–5 mm high. Filaments usually green, antesepalous ones 9–15(–20) mm long, the antepetalous ones 7–11(–16) mm long; anthers oblong, yellow, 3.5–4.5 mm long, 2–3 wide. Style retrorse villous in lower $\frac{1}{3}$, exserted 10–15 mm beyond the anthers; stigma clavate, 2.5–3.5 mm long, ca. 2 mm wide, green. Berry cylindrical, 16–18 mm long, 11–12 mm wide, shiny light red when ripe, seeds mostly 60–70 per fruit, triangular-ovate in outline, ca. 2 mm long, 1.3–1.7 mm wide, light brown. Gametic chromosome number, $n = 11$.

Distribution. Venezuelan Andes, in subpáramo and cloud forest in Estados Mérida and Trujillo, (2,600–)2,750–3,400 m. Flowers mostly in the dry season, from January to April. Figure 15.

Specimens examined. VENEZUELA. TRUJILLO: Guiriguay, towards Peñas Blancas, *Aristiguieta & Medina* 3599 (NY, VEN); Páramo de la Cristalina, *Jahn* 12 (US, VEN); Dtto. Carache, above La Laguneta, Páramo de El Turmal, near Edo. Lara, *Ruiz-Terán & Lopez-Figueras* 906 (MERF, MO). MÉRIDA: Páramo de Timotes, *Alston* 6622 (BM); Sierra Nevada, near Laguna Coromoto, *Barclay & Juajibioy* 9985 (RSA); Páramo de Santo Domingo, Cascada La Victoria, *Benítez de Rojas* 1296 (MY); 5 km above El Rincón de La Venta, Timotes-El Aguila, *Berry* 3136 (MO, VEN); 36–38 km from El Aguila to Piñango, *Berry* 3137 (MO, VEN), *Luteyn et al.* 6193 (NY); 24 km above Timotes on road to El Aguila, *Berry* 3278 (MO—2 sheets, VEN); Mesa de Los Pinos, above La Mucuy, *Berry* 3443 (MO, VEN), 3444 (MO), 3446-B (MO—2 sheets), 3447 (MO); along artificial lake above Hotel Los Frailes, 12.5 km below Apartaderos, *Berry* 3465 (MO, VEN), 3598 (MO); entrance to Hotel Los Frailes, *Berry* 3652 (MO); 73 km NE of Mérida, road to Barinas, *Breteler* 3354 (NY, S, U, US); between Mucubají and Sto. Domingo, *de Bruijn* 939 (MER, MO, VEN), *Dennis* 2120 (K); 4 km from Laguna Mucubají towards Sto. Domingo near artificial lake, *Foldats* 2469 (VEN—2 sheets); Chachopo, *Funck & Schlim* 798 (BM, CGE, F, G-DC, MPU, OXF, P); Páramo de Timotes, *Jahn* 508 (GH, US); Timotes, *Karsten s.n.* (W); Páramo de los Conejos, *Lasser* 511 (US, VEN); San Martín, 10 km S of San Rafael de Mucuchíes, *Ruiz-Terán* 992 (MER—2 sheets); near Minigú, 10–15 km S of San Rafael de Mucuchíes, *Ruiz-Terán* 997 (MER, MO), 7208 (MO); between Laguna de Coromoto and Qda. El Oso, *Ruiz-Terán & López-Palacios* 1663 (MERF, MO); Laguna Brava, between Río Los Granates and Loma La Paja, Páramo Los Granates, 15 km E of Sierra Nevada de Sto. Domingo, *Ruiz-Terán* 6281 (MERF, MO); Cañada Cerrada, between Chachopo and El Aguila, *Ruiz-Terán & Dugarte* 12947 (MERF, MO); Las Tapias, from Apartaderos to Barinas, *Ruiz-Terán* 13438 (MERF); near Laguna de Coromoto, *Schulz et al.* 326 (MER, U, VEN); above Chachopo, *Steyermark* 56751 (F, NY, VEN); La Aguada, *Vareschi s.n.* (MER).

Fuchsia membranacea is an opposite-leaved member of sect. *Hemsleyella* that inhabits upper cloud forest and penetrates into subpáramo vegetation. In both areas, it can be found as a liana, epiphyte or terrestrial shrub on rocks or in humus. In habit and in many vegetative characters, it strongly resembles *F. tillettiana*, which has a similar distribution in Venezuela, but these species differ in habit and several floral traits. *Fuchsia membranacea* occurs in higher cloud forest, including the subpáramo, between 2,750 and 3,400 m, whereas *F. tillettiana* grows in cloud forest between 1,600 and 2,650 m. In *F. membranacea*, the filaments are shorter and greenish, the sepals are non-reflexed and dull pink to green, and the flowers are glabrous and axillary or grouped at the branch tips, but not subracemously, as in *F. tillettiana*. Because of the absence of morphologically or ecologically inter-

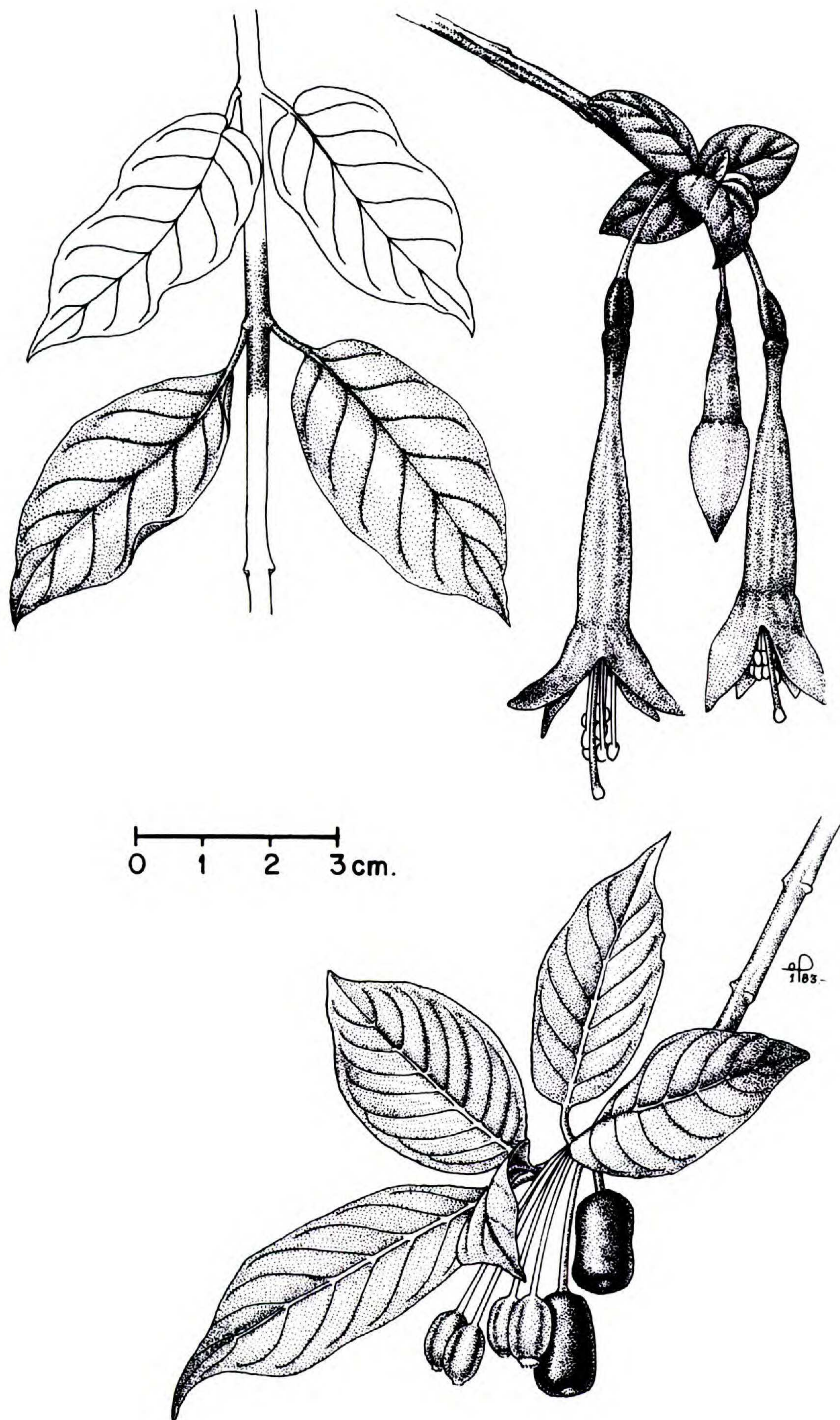


FIGURE 17. *Fuchsia membranacea*, flowering branch from *Berry* 3465, Edo. Mérida, Venezuela; leaves and fruiting branch from *Berry* 3136, Edo. Mérida, Venezuela.

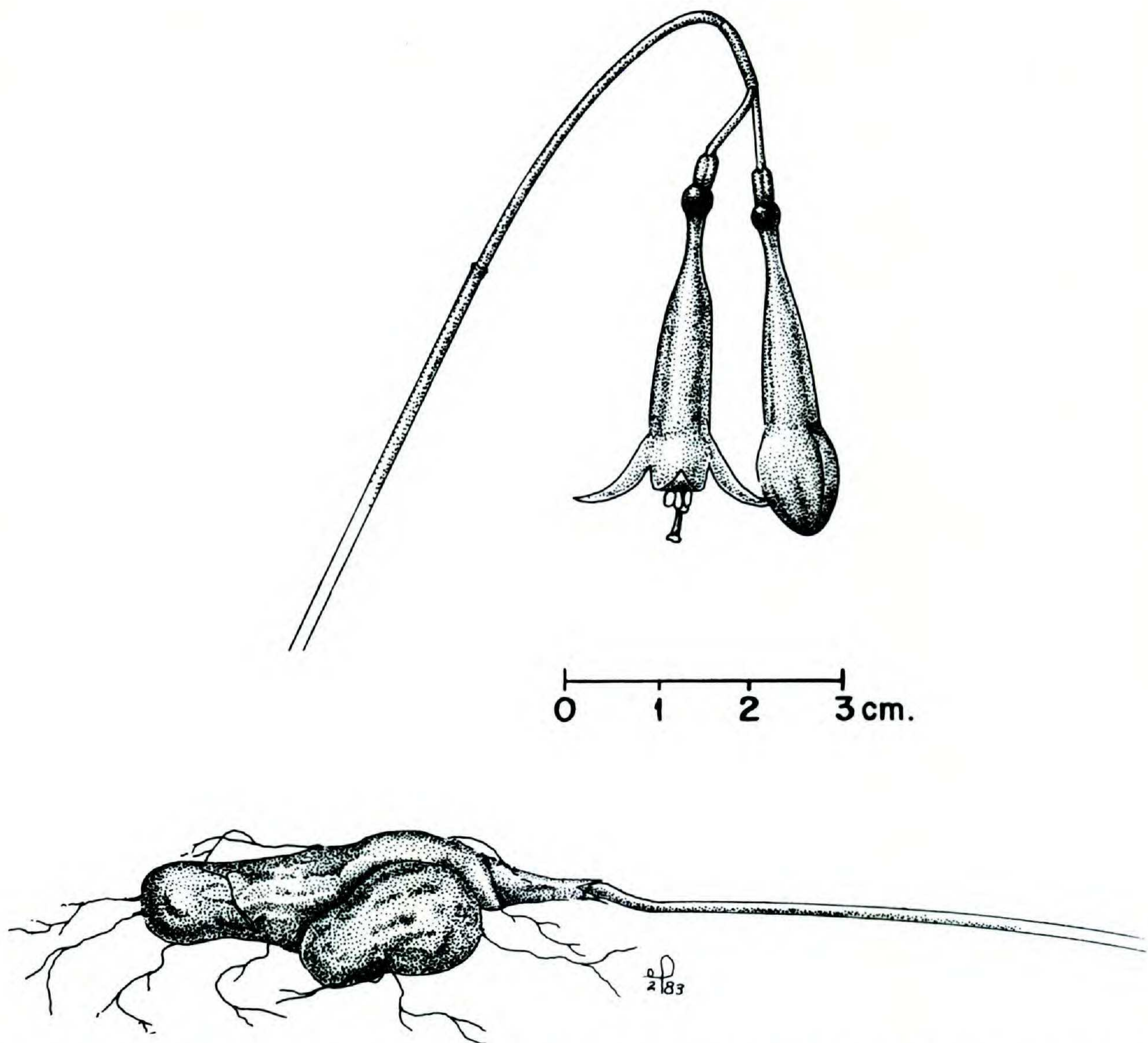


FIGURE 18. *Fuchsia nana*, flowering branch and tubers, from Berry & Berry 2581, Dept. Cochabamba, Bolivia.

mediate plants, both taxa are recognized as distinct species.

10. *Fuchsia nana* P. Berry, sp. nov. TYPE: Bolivia. Dept. Cochabamba: Incachaca Pass, on rocks and amongst overhanging roots on a bank above the road, 3,500 m, Aug. 1950, Brooke 6920 (holotype, BM; isotypes, F, G-DEL, NY, U). Figure 18.

Frutex nanus epiphyticus saxatilisve; caules erecti vel repentes 3–10 dm longi, stolonibus 2–8 dm longis et tuberibus numerosis lateralibus ellipsoidalibus cupreis. Folia alterna saepe hysterantha, membranacea, ovato-lanceolata, apice acuminata, basi rotundata. Flores pauci axillaresque ad apicem ramorum juniorum, pedicellis 10–14(–19) mm longis. Tubi florales infundibuliformes, 21–29(–31) mm longi, basi ca. 3 mm lati bulbosique, superne dilatati summo 7–8 mm lati. Sepala lanceolato-ovata, 12–14(–16) mm longa, 5–8 mm lata, basi connata 2–3 mm.

Erect to creeping subshrubs 3–10 dm tall in

rocks, or epiphytic in trees, with stoloniferous stems 2–8 dm long and numerous ellipsoid, copper-colored tubers lateral to the stem. Branchlets glabrous to loosely pilose, terete, 1.5–3 mm thick, reddish to copper; older stems 2.5–4 mm thick, with freely exfoliating bark. Leaves alternate, usually absent when flowering, membranous, (narrowly) lance-ovate, 20–35 mm long, 10–20 mm wide, apex acuminate, base rounded, glabrous above, usually pilose along the nerves below and sometimes purple-tinged; margin remotely denticulate, secondary veins 4–5 on either side of the midvein. Petioles 7–11 mm long. Stipules filiform, 1.5–2 mm long, deciduous. Flowers few and axillary near the tips of young shoots. Pedicels slender, glabrous, 10–14(–19) mm long. Ovary cylindrical to ellipsoid, 7–7.5 mm long, 2–3(–4) mm wide, lustrous cherry red, glabrous to pilose. Floral tube funnelform, 21–29(–31) mm long, ca. 3 mm wide and more or less bulbous

at the base, constricted above the base to ca. 2 mm wide, then widened above until 7–8 mm wide at the mouth, glabrous to sparsely pilose outside, pilose inside in lower $\frac{1}{2}$. Sepals lance-ovate, 12–14(–16) mm long, 5–7(–8) mm wide, apex acute to obtuse, connate for 2–3 mm at the base, divergent at anthesis. Tube and sepals bright red-pink, with a dark purple ring usually present around the mouth of the tube. Nectary 2–3 mm high. Filaments red, the antesealous ones 8–10 mm long, the antepetalous ones 6–8 mm long; anthers ellipsoid, cream, 2–2.5 mm long, 1–2 mm wide. Style red-pink, densely retrorse villous in lower $\frac{1}{2}$; stigma green, globose, ca. 1.5 mm long and wide, exserted 5–10 mm beyond the anthers. Young berry ellipsoid, 11 mm long, 6 mm wide.

Distribution. Endemic to upper cloud forest in Dept. Cochabamba, Bolivia, (2,000–)3,000–3,700 m. Flowering principally in the dry season, from (April to) July to November. Figure 10.

Specimens examined. BOLIVIA. COCHABAMBA: Km 100 of Cochabamba-Villa Tunari road, *Badcock 313* (K); below and N of Lago de Corani along road to Chapare, *Berry & Berry 2581* (MO); Incachaca District, *Brooke 3738* (BM—mixed collection, F, NY); Toralapa, way to Yungas de Vandida, *Cárdenas 3753* (POM); Plumerito, 18 km from Colomi to Tablas, *Cárdenas 4090* (RSA); Cumbre de San Mateo-Vallegrande, *Cárdenas 4091* (RSA), *4092* (RSA); Km 28 between Colomi and truck terminal on way to Tablas, *Cárdenas s.n.* (RSA).

Fuchsia nana is readily recognized by the small size of the plant and its lustrous red-pink flowers with tubes just 2–3 cm long. It is a highly seasonal and almost exclusively epiphytic species, flowering when leafless and bearing many small tubers. Whereas the other members of sect. *Hemsleyella* in Dept. Cochabamba grow at lower elevations, *F. nana* inhabits the upper limit of the cloud forest. Both the high altitudinal range and the characters mentioned above would appear to relate *F. nana* most closely to *F. apetala*.

11. *Fuchsia pilaloensis* P. Berry, sp. nov. TYPE: Ecuador. Prov. Cotopaxi: around Pilaló, 79°02'W, 0°57'S, 2,400 m, 9 July 1968, *Holm-Nielsen & Jeppesen 1547* (holotype, AAU; isotypes, DS, S). Figure 19.

Frutex terrestris erectus usque 1 m altus vel epiphyticus, ramis pendulis elongatis, tuberibus interdum adsunt. Folia plerumque alterna aliquando opposita, membranacea, anguste ovata, apice acuminata, basi

acuta vel rotundata, 40–122 mm longa, 25–54 mm lata, petiolis 15–38 mm longis. Flores pauci vel numerosi in ramulis axillaribus vel ad apicem ramorum aggregati, pedicellis 15–22 mm longis. Tubi florales anguste infundibuliformes, 44–53 mm longi, basi 3–4.5 mm lati bulbosique inde 2–3 mm lati constricti, superne gradatim dilatati summo 6–10 mm lati. Sepala anguste ovata, 13–20 mm longa, 7–8 mm lata, apice acuta, basi 4–7 mm connata, limbis sub anthesi valde patentibus.

Terrestrial shrubs 0.5–1 m tall or lianas or epiphytes with long, hanging branches to 8 m high in trees; tubers sometimes present or else thickened stems 10–20 mm diam. Branchlets terete, dull purple-green, densely pilulose, 2–4 mm thick; older branches reddish purple, freely exfoliating. Leaves usually alternate, occasionally opposite or subopposite, membranous, narrowly ovate, 40–120 mm long, 25–54 mm wide, often unequal on either side of the margin, apex acuminate, base acute to rounded, subglabrous to scattered pilose above, pilose below along nerves and margins; margin subentire to denticulate, secondary veins 6–9 on either side of the midvein. Petioles pubescent, 15–38 mm long. Stipules filiform, ca. 2 mm long, 0.2–0.4 mm wide, deciduous. Flowers few to many, grouped towards the tip of branches or axillary branchlets, sometimes subtended by reduced leaves. Pedicels pilose, usually pink, 15–22 mm long. Ovary cylindrical, 5–7 mm long, ca. 2 mm wide, dull purple, pubescent. Floral tube narrowly funnel-form, 44–53 mm long, 3–4.5 mm wide and bulbous at the base, then narrowed to 2–3 mm wide in lower $\frac{1}{3}$ and gradually widened above until 6–10 mm wide at the rim, densely pilose outside, pilose inside in lower $\frac{1}{3}$. Sepals narrowly ovate, 13–20 mm long, 7–8 mm wide, apex acute, connate at base for 4–7 mm, lobes strongly spreading at anthesis. Tube pale pink; sepals whitish to pale pink, sometimes greenish in bud. Nectary green-purple, lustrous, 3–4 mm high. Filaments dull green, the antesealous ones 12–15 mm long, the antepetalous ones 7–9 mm long; anthers oblong, yellow, 3–4 mm long, 2.5–3 mm wide. Style pale pink, densely retrorse villous in lower $\frac{1}{2}$, stigma globose, green, ca. 2 mm long, 2–2.5 mm wide, slightly 4-cleft at the apex. Berry 4-angled before maturity, oblong, verrucose, purplish; mature berry not seen.

Distribution. Known only from cloud forest above Pilaló, Prov. Cotopaxi, Ecuador, 2,400–3,150 m. Known to flower in June and July. Figure 15.

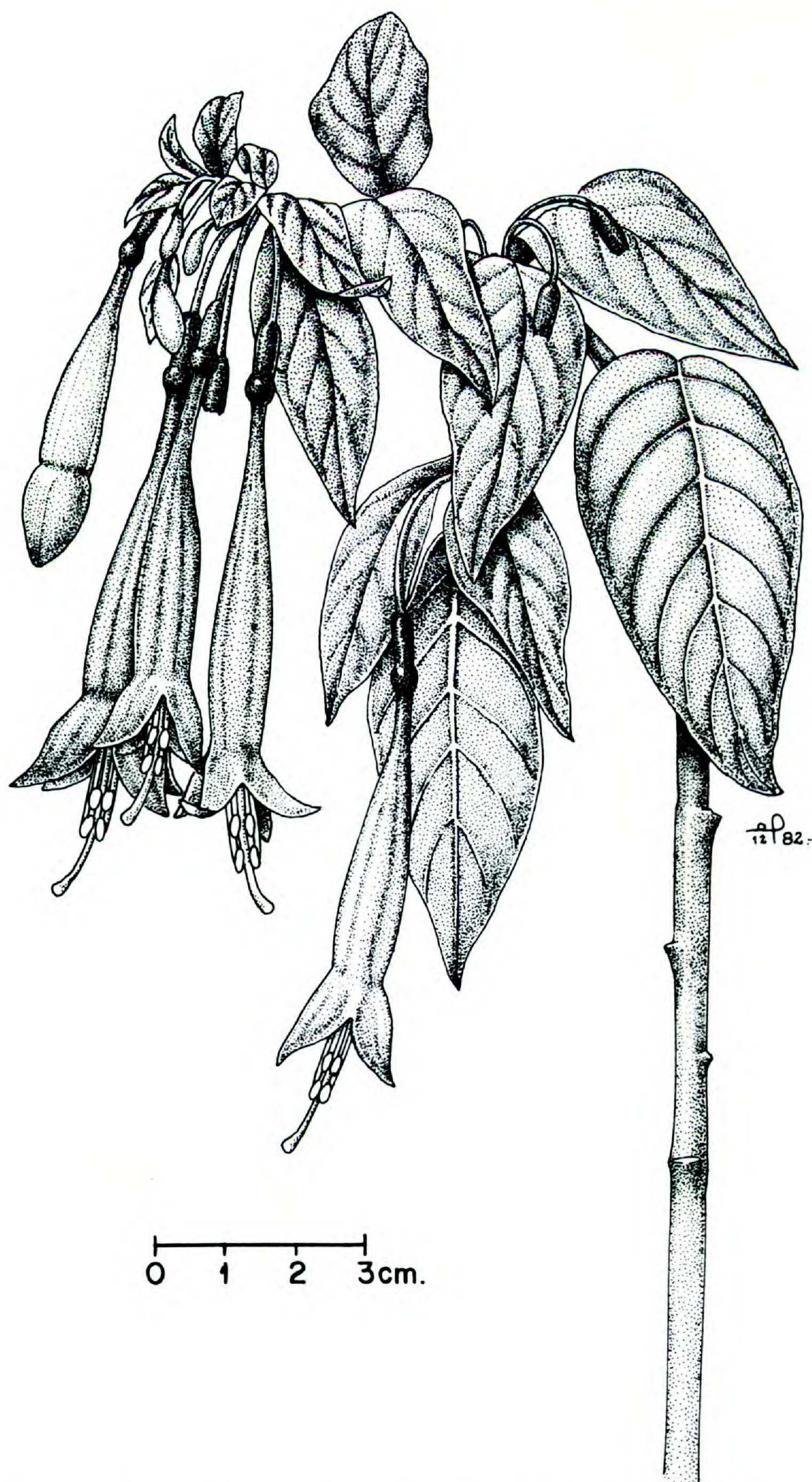


FIGURE 19. *Fuchsia pilaloensis*, flowering branch from Berry & Berry 2551, Prov. Cotopaxi, Ecuador.

Specimens examined. ECUADOR. COTOPAXI: 10 km above Pilaló on Quevedo-Latacunga road, 3,150 m, Berry & Berry 2548 (MO, Q); 5 km above Pilaló, 2,760 m, Berry & Berry 2551 (MO); 7 km above Pilaló, Albert de Escobar & Escobar-Urbe 1479 (MO, TEX). CULTI-

VATED: Berkeley, California, Univ. Calif. Botanical Garden Accession No 58.782-1, originally collected by C. K. Horich in Prov. Cotopaxi, Ecuador, between Pilaló and Macuchí, Hutchison, 1961 (RSA, UC), 1965 (RSA).

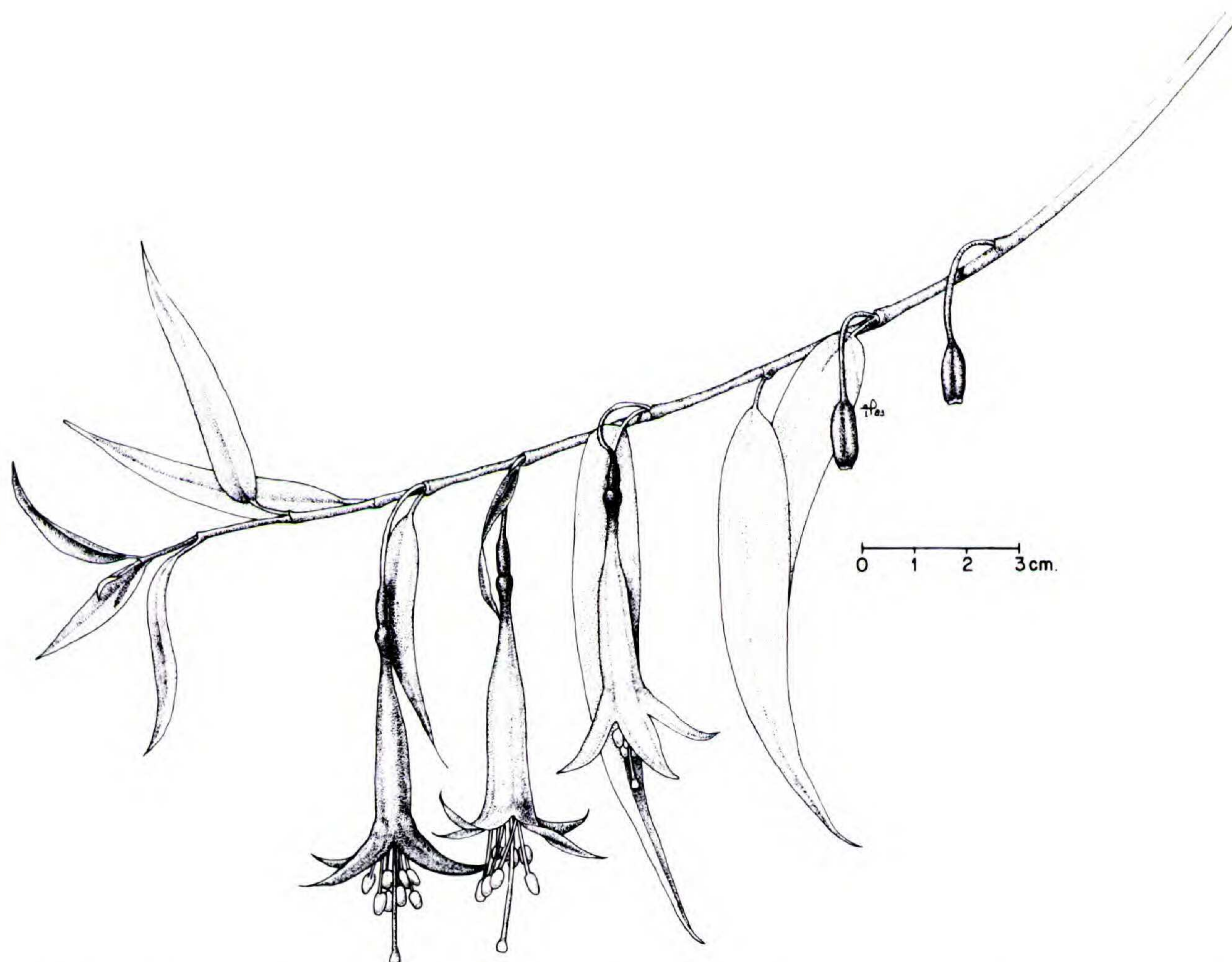


FIGURE 20. *Fuchsia salicifolia*, flowering branch from Vargas 3486, Prov. La Convención, Dept. Cuzco, Peru.

This species is restricted to an area of western Ecuador where no other species of sect. *Hemsleyella* is known, but where several species of sect. *Fuchsia* occur (Berry, 1982). *Fuchsia pilaloensis* is characterized by its light pink, narrow-tubed flowers, with pale sepals and narrowly ovate, mostly alternate leaves. In the same local area, this species has been found both as a small terrestrial shrub with leaves as well as a profusely flowering climber or epiphyte; no tubers were detected in either case.

12. *Fuchsia salicifolia* Hemsley, J. Bot. 14: 70. 1876. Munz, Proc. Calif. Acad. Sci., Ser. 4, 25: 78. 1943. TYPE: Bolivia. Dept. La Paz: Prov. Nor Yungas, Sandillani, 7,000–8,000 ft., Apr. 1866, Pearce (holotype, K). Figure 20.

Fuchsia tuberosa Krause, Repert. Spec. Nov. Regni Veg. 1(11): 170. 1905. *Fuchsia tuberosa* Krause var. *typica* Munz, Proc. Calif. Acad. Sci., Ser. 4, 25: 76, pl. 12, fig. 66. 1943. TYPE: Peru. Dept. Puno: Prov. Sandia, between Sandia and Cuyocuyo, in rocks, 2,700–2,800 m, Weberbauer 875

(holotype, B, destroyed in World War II, photograph at F; isotype, G-DC).

Epiphytic shrubs on tree trunks, occasionally growing in rocks. Stems sometimes stoloniferous, with globose-ellipsoid tubers 2–3 cm diam., the stems often growing down tree trunks for several meters under moss. Branchlets terete, 2–4 mm thick, smooth reddish, subglabrous to lightly pubescent; older stems 5–15 mm thick with freely exfoliating bark, often 1–3 m long and hanging when epiphytic. Leaves alternate, firmly membranous, (narrowly) lanceolate, 60–135(–160) mm long, 18–37(–40) mm wide, apex generally long acuminate, base acute to rounded and often unequal, pale green and subglabrous above, light green to purplish and subglabrous below; margin remotely denticulate, secondary veins 7–9 on either side of the midvein. Petioles 5–20(–30) mm long. Stipules filiform, 1.5–2 mm long, ca. 0.3 mm wide, deciduous. Flowers generally few, axillary or clustered near branch tips. Pedicels slightly pubescent, 12–30 mm long. Ovary (narrowly) cylindrical, 8–11 mm long, ca.

2.5 mm wide, dull green, puberulent. Floral tube narrowly funnelform, 40–54(–60) mm long, 3–4(–5) mm wide and more or less bulbous at the base, then narrowed to 1.5–2(–2.5) mm in the lower $\frac{1}{3}$ and gradually widened above until 7–10 mm wide at the rim, glabrous to puberulent outside, villous inside in lower $\frac{1}{3}$. Sepals narrowly ovate, 23–30 mm long, 6–10 mm wide, apex acute to subacuminate, base connate for 2–4(–5) mm, spreading-divergent at anthesis, the distal portions sometimes curled back. Tube red-pink, sepals similar or paler, a dark purple ring usually present at the throat of the tube. Nectary 3–4.5 mm high. Filaments red to dark purple, the antesealous ones 15–26 mm long, the antepetalous ones 12–20 mm long; anthers oblong, yellow, 2.5–3.5 mm long, 1–1.5 mm wide. Style pink, retrorse villous in lower $\frac{1}{3}$; stigma globose to subclavate, dull green, ca. 2.5 mm long, 1.5–2 mm wide, exserted 6–12 mm beyond the anthers. Mature berry not seen.

Distribution. Southern Peru (Depts. Cuzco and Puno) and Dept. La Paz, Bolivia, in cloud forest, (2,000–)2,500–2,900 m. Flowers in the dry season, principally from July to October. Figure 10.

Specimens examined. PERU. CUZCO: La Convención, Huayopata, 10 km SW of Incatambo, *Peyton & King 1427* (MO); Pintobamba, El Dorado, La Convención, *Vargas 3486* (BH, CUZ, MO); Prov. Convención, Quellomayo to Lucumayo, *Vargas 4533* (CUZ, MO); Prov. Calca, Valle de Laco, Río Paucartambo, *Vargas 11106* (CUZ). PUNO: Prov. Carabaya, between Ayapata and Kahualluyoc, *Vargas 10765* (CUZ, W). BOLIVIA. LA PAZ: Prov. Nor Yungas, 10 km below Unduavi road to Coroico, *Berry & Berry 2578* (MO—2 sheets); Unduavi, *Rusby 1803* (NY); Prov. Nor Yungas, 6.7 km below Chuspipata on road to Yolosa, *Solomon 9683* (MO). WITHOUT LOCALITY: *Pearce 799* (K).

This species is best distinguished by its narrowly lanceolate, unequal leaves with long, acuminate tips and by its pink, narrowly funnelform floral tubes. Most specimens have leaves present together with flowers, but *Berry & Berry 2578* was almost leafless when collected.

Close examination of the isotype and the photograph of the destroyed holotype of *F. tuberosa* reveals that it is not specifically different from *F. salicifolia*, whereas Munz (1943), who did not have the opportunity to examine the type material, mistook *F. tuberosa* for what we now recognize as *F. chloroloba*, which also has tubers, but has orange-red and green flowers, a sharply constricted floral tube and entirely glabrous leaves and flowers.

13. *Fuchsia tillettiana* Munz, *Aliso* 7: 410. 1972. TYPE: Venezuela. Edo. Lara: Dtto. Jiménez, between Sanare and Laguna La Blanquita, 1,700 m, 24 Mar. 1970, *Tillett 703-35* (holotype, RSA-226553; isotypes, GH, MO, NY, US). Figure 21.

Fuchsia apetala sensu Munz, *Proc. Calif. Acad. Sci.*, Ser. 4, 25: 80. 1943, pro parte.

Terrestrial shrubs 0.5–2 m tall, or growing in rocks, climbing up trees or epiphytic in trees to 10 m above ground; small, lateral tubers occasionally present in the soil on large plants. Branchlets puberulent, terete, 2–5 mm thick, red or copper-colored; older branches ascending on shrubs, flexuous and erect to drooping and to 10 m long on hanging bushes, the rooted portions often to 25 mm thick, with freely peeling, flaky bark. Leaves opposite or ternate, soft membranous, elliptic to narrowly ovate, (30–)55–100 mm long, (7–)16–50 mm wide, apex (sub-)acuminate, base rounded to acute, subglabrous to pruinous or puberulent above, subglabrous to puberulent and pale green below; margin subentire to serrulate, secondary veins 7–9 on either side of the midvein. Petioles puberulent, green or reddish, 6–12(–30) mm long. Stipules lance-triangular, 1–2 mm long, 1–1.5 mm wide. Flowers generally numerous at branch tips or subracemose; leaves often absent, or small bracts 15–30 mm long and 6–20 mm wide present when flowering. Pedicels red-purple, 25–50 mm long. Ovary cylindrical, more or less sulcate, 8–10 mm long, 2.5–3.5 mm wide, green to purplish, usually with glandular hairs. Floral tube funnelform, 36–46 mm long, 2–5 mm wide at the base, slightly narrowed in lower $\frac{1}{3}$, then gradually widened until 7–9(–13) mm wide at the rim, glandular-pubescent outside, pilose inside in lower $\frac{1}{3}$. Sepals lanceolate, 19–33 mm long, 4–6(–10) mm wide, apex acute, base connate for 2–3 mm, blunt-tipped in bud, strongly recurved at anthesis. Tube and sepals cerise or rose pink. Nectary glossy green, 3–4 mm high. Filaments pink to cerise or dark purple, the antesealous ones 20–35 mm long, the antepetalous ones 15–28 mm long; anthers oblong, yellow, 4–5 mm long, 2.5–3 mm wide. Style pink, retrorse villous in lower $\frac{1}{2}$ – $\frac{1}{3}$, exserted 15–20 mm beyond the anthers; stigma green, clavate, ca. 3 mm long, 2–2.5 mm wide. Berry cylindrical, usually more or less narrowed at the apex, 18–21 mm long, 6–10 mm wide, puberulent, dull purple-green to lustrous bright red when ripe; seeds ca. 50 per fruit, light tan, 1.8–2 mm long,

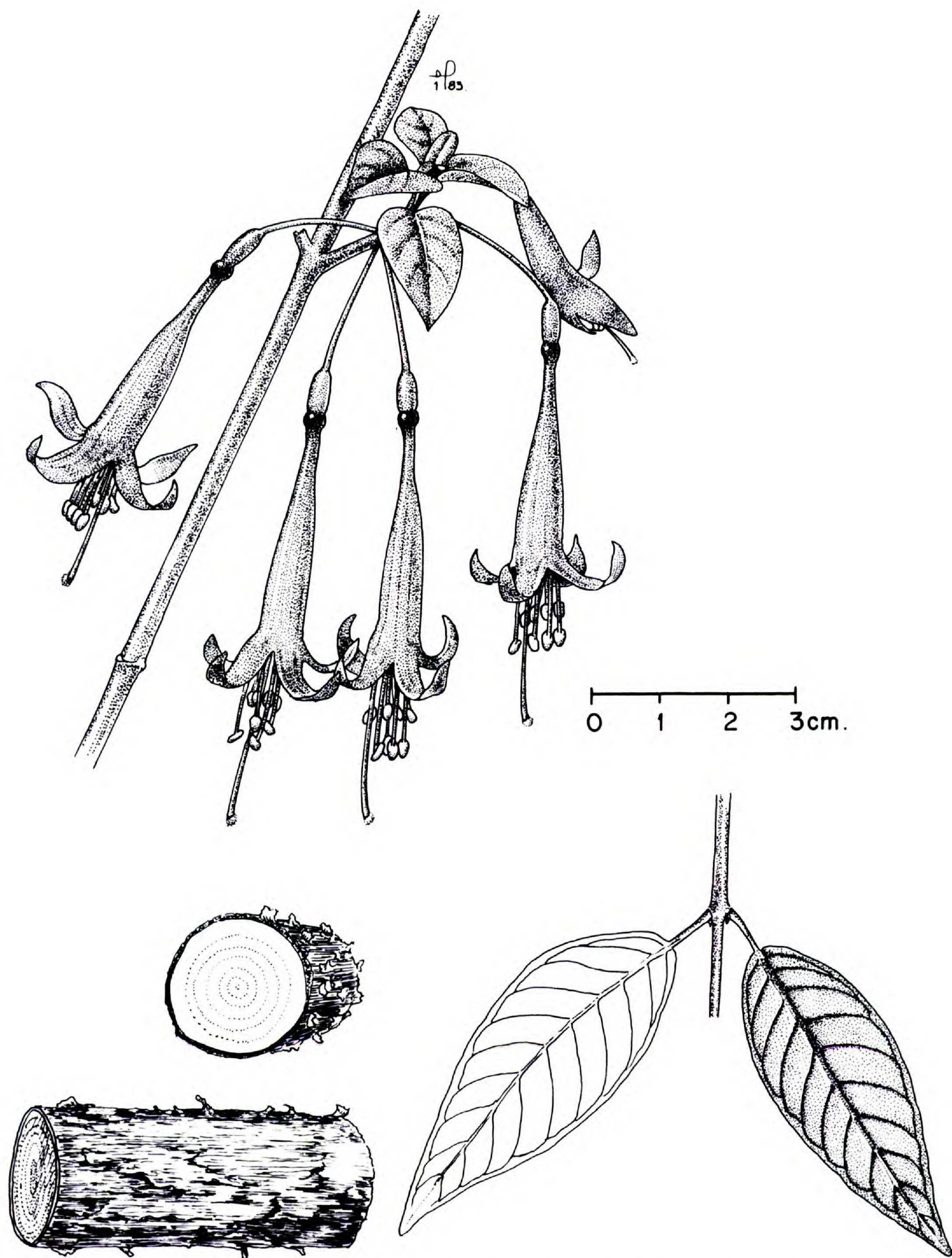


FIGURE 21. *Fuchsia tillettiana*, flowering branch from *Berry* 3463, Edo. Mérida, Venezuela; leaves and stem portion from *Berry* 3265, Edo. Lara, Venezuela.

1.3–1.6 mm wide. Gametic chromosome number, $n = 11$.

Distribution. Venezuelan Andes, cloud forest in Estados Lara, Trujillo, Mérida, and Táchira, 1,600–2,650 m; one doubtful collection from Colombia. Flowers mainly in the dry season when leafless, from January to April. Figure 15.

Specimens examined. VENEZUELA. LARA: Parque Nacional Yacambú, 13–17 km S of Sanare, *Berry* 3265 (MO, VEN), 3267A (MO), 3267B (MO), 3467 (MO), 3469 (MO), *Dunsterville & Dunsterville*, 1969 (VEN), *Garófolo*, 1979 (MO), *Steyermark & Carreño* 108848 (MO, VEN), *Tillett* 711-26 (MER), 714-41 (MER). TRUJILLO: La Mesa de Esnujaque, *Box & Alayón* 3710 (BM, VEN). MÉRIDA: 1.5 km above San José, road to Mucutuy, *Berry* 3463 (MO, VEN), 4280 (MO, VEN); forest above La Veguilla, above Mucutuy, *Berry* 3464 (MO, VEN), 4289 (MO, VEN); banks of Qda. La Campana, 4.2 km below La Mitisús on Barinas-Apartaderos road, *Berry* 4314 (MO, VEN); between La India and El Morro, *Ijjasy-Madriz* 451 (NY, VEN); Páramo de San José, *Jahn* 969 (US, VEN); Páramo de Mucuchachí, *Jahn* 981 (VEN); Páramo de Aricagua, *Jahn* 1030 (US); Mucutaray, between San Isidro and Qda. Mucubají, more or less 15 km ESE of El Morro, *Ruiz-Terán & Lopez-Figuieras* 8603 (MERF, MO); Páramo de Pozo Negro, between San José and Beguilla, *Steyermark* 56293 (F, NY, VEN). TACHIRA: Dtto. Cárdenas, 15 km E of Zumbador on road to Queniquea, *Berry* 3303 (MO—2 sheets, VEN).

One of six opposite-leaved species in sect. *Hemsleyella*, *Fuchsia tillettiana* is most readily recognized by its glandular-pubescent floral tubes (best seen when fresh), strongly reflexed sepals, long filaments (20–35 mm long in the antesealous whorl) and the cerise color in both the tube and the sepals. The flowers of *F. tillettiana* are grouped subracemously at the branch tips, and anthesis usually occurs when the plant is leafless, although shade plants often bear leaves and flowers together. Tubers seldom occur on plants of *F. tillettiana*, but thick semisucculent stems seem to supplant the storage function of tubers in climbing and epiphytic plants. Woody, erect stems predominate when the species occurs as a terrestrial shrub, but when growing as a climber, plants produce long, flexuous stems that climb up to 10 m high in trees and then clamber or droop down over the adjacent vegetation.

Fuchsia tillettiana occupies approximately the same geographical range as *F. membranacea*, to which it is closely related; their main differences are discussed under *F. membranacea*.

A specimen of somewhat doubtful origin, *Dawe* 896 (K, Colombia, in the páramos, tuberous), lacks leaves, but has pubescent flowers with

narrow, though not evidently reflexed, sepals that agree most closely with *F. tillettiana*. The notation of the presence of tubers and of inhabiting páramos casts doubt, however, on it belonging to this species. More complete specimens with detailed locality information would be necessary to evaluate the proper placement of this collection.

14. *Fuchsia tunariensis* O. Kuntze, Revis. Gen. Pl. 3(2): 98. 1898. Munz, Proc. Calif. Acad. Sci., Ser. 4, 25: 79, pl. 13, fig. 68. 1943. TYPE: Bolivia. Dept. Cochabamba: Tunari Range, 3,000 m, Apr.–May 1892, *Kuntze* (holotype, NY, photograph at UC). The type collection is a very poor specimen with no flowers left, but the leaves agree well with the type description. Figure 22.

Fuchsia mattoana Krause, Bot. Jahrb. Syst. 37: 599. 1906. TYPE: Peru. Dept. Cuzco: Prov. Convención, road from Cuzco to Santa Ana, 3,400 m, June 1906, *Weberbauer* 4976 (holotype, B, destroyed in World War II, photograph at F).

Shrub 0.8–1.5 m high, growing terrestrially in humus, on rocks, or epiphytically in trees, with cylindrical-ellipsoid tubers 1–3 cm thick and 8–15 cm long usually present. Young growth velutinous, pilulose or cinereous; branchlets terete, 2–4 mm thick, pilulose; older branches with freely exfoliating bark. Leaves opposite or less often alternate, membranous, broadly ovate to elliptic-ovate, 60–110(–115) mm long, 35–65 mm wide, apex (sub-)acuminate, base acute to cordate, subglabrous to pilulose above, scattered to densely pubescent below, especially along the nerves; margin remotely denticulate, secondary veins 6–9 on either side of midvein. Petioles pubescent, (10–)15–33 mm long. Stipules narrowly triangular, ca. 1.5 mm long, deciduous. Flowers generally few and axillary towards young branch tips. Pedicels finely pubescent, 15–30(–50) mm long. Ovary cylindrical, velutinous to pilulose, 9–11 mm long, 2.5–3 mm wide. Floral tube funnel-form, (36–)44–56 mm long, 3.5–4.5 mm wide and more or less bulbous at the base, then slightly constricted to ca. 3 mm wide and widened gradually above until 6–10 mm wide at the rim, finely pubescent outside, villous inside for most of length. Sepals lanceolate to (narrowly) ovate, 17–25 mm long, 7–8(–9) mm wide, apex acute to acuminate, connate for 3–4 mm at the base, divergent at anthesis. Tube and sepals bright red-pink to light orange. Nectary 2.5–4 mm high.

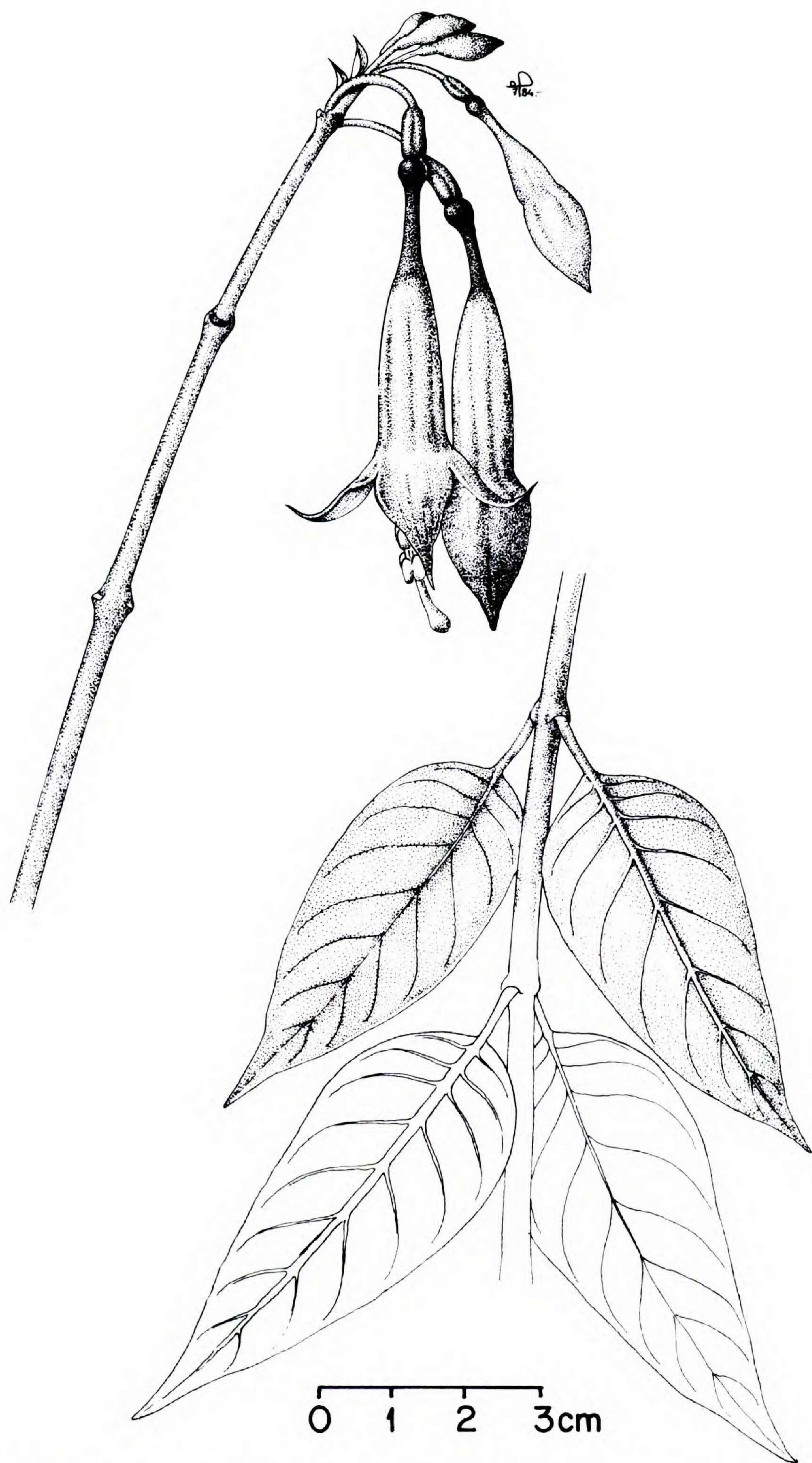


FIGURE 22. *Fuchsia tunariensis*, flowering branch and leaves from *Berry 3051*, Dept. Ayacucho, Peru.

Filaments greenish, the antesepalous ones 14–20 mm long, the antepetalous ones 8–13 mm long; anthers oblong-ellipsoid, yellow, 3–3.5 mm long, ca. 2 mm wide. Style orange to pink, villous for most of length; stigma globose, green, 2–3 mm long, ca. 2 mm wide, exerted 6–20 mm beyond the stamens. Mature berry not seen. Gametic chromosome number, $n = 11$.

Distribution. Southern Peru and Bolivia. Rare in cloud forest from Dept. Ayacucho, Peru, to Dept. Cochabamba, Bolivia, 2,400–3,400 m. Flowers mostly at the end of the dry season, from September to November. Figure 10.

Specimens examined. PERU. AYACUCHO: 45 km E of Tambo on road to Ayna, *Berry 3051* (MO). CUZCO: W of Salcantay, *Hein*, 1946 (F); Prov. Convención, "El Dorado," *Vargas 3485* (BH, CUZ, MO); Prov. Paucartambo, Pillahuata, *Vargas 3673* (BH, CUZ, MO), *Vargas 16765* (CUZ), *West 7106* (GH, UC); Cosñipata, close to Paso El Aguila, *Vargas 17820* (CUZ); Prov. Calca, road to Chiriquay, *Vargas 23049* (CUZ, MO). BOLIVIA. COCHABAMBA: Km 99 of Cochabamba-Villa Tunari road, *Badcock 312* (K); Choro, above Río Cocopata, 100 mi. NW of Cochabamba, *Brooke 6151* (BM, F), *6247* (BM); road to Incachaca, *Brooke 6809* (BM, F, NY); Km 103 of Cochabamba-Chapare road, *Cárdenas 5969* (DC, UC, US); Km 102 of Cochabamba-Aguirre-Todos Santos road, between Comercocha and Palmar, *Ugent & Ugent 5060* (DS, GH, K).

This species is best distinguished by its mostly opposite leaves and the soft, velutinous-cinereous pubescence on the leaves, flowers, and young shoots. The flowers are apparently uniformly colored, typically rose salmon to light orange, although the sepals may be slightly greenish at the apex. Many specimens bear leaves and flowers at the same time, and although the plants are characteristically tuberous, they can grow in a variety of situations—as epiphytes, or as terrestrial shrubs in rocks or in humus soil. Since this variety of habitats can give rise to considerable vegetative variation, and there are so few collections made of this species, with a considerable gap between the Bolivian and the Peruvian collection localities, more material is needed to determine if the plants from these two areas are really conspecific.

A single collection from Dept. Huánuco, Peru, is possibly a new species, most closely allied to *F. tunariensis*: *Meza 360* (MO, Peru, Dept. & Prov. Huánuco, Quebrada before Utao, 2,430 m, 4 Oct. 1965, shrub with pink flowers and greenish sepal tips) has opposite to ternate, ovate leaves, canescent-pilose pubescence, erect stems, pilose floral tubes 40 mm long (in bud) and sepals 12 mm long by 4 mm wide. The sepals of this

plant, though still immature, are too small and contrast too strongly in color with the floral tube to be placed in *F. tunariensis*, but mature flowering specimens would be desirable before describing it as a new species of sect. *Hemsleyella*.

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